THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXXVII., No. 25. Whole No. 1,697. | NEW YORK, MONDAY, DECEMBER 16, 1907. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. THOMAS J. CUNNINGHAM, ELBERT P. CALLENDER. } Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, New York.

Telephone.—2996 John.

Terms of Subscription, Including Postage.—For the United States, $3; Canada, $4 per annum. European countries, $5 (£1—25 francs).

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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BRIEFLY TOLD.

LIST OF NAMES, OFFICIAL BALLOT, ILLUMINATING ENGINEERING SOCIETY.—The official ballot for officers to serve the Illuminating Engineering Society during the coming year, the voting for whom is now underway by means of the mail system, carries the following names, as proposed by the Nominating Committee:

For President.—Dr. Louis Bell, Boston, Mass.
For Vice-Presidents.—Arthur Williams, New York; C. E. Stephens, Pittsburgh, Pa.
For General Secretary.—V. R. Lansingh, New York.
For Treasurer.—Dr. A. H. Elliott, New York.
For Directors.—W. H. Gartley, M. K. Eyre and Basset Jones, Jr.

It is stipulated that "Ballots to be counted must reach the Secretary not later than the 26th inst." The list of nominees is certainly an attractive one.

THE STATE CONCEDES THE TUNNEL RIGHT TO THE ASTORIA COMPANY.—Some years ago the Company, which corporation is closely allied to the Consolidated Gas Company, of this city, applied to the Legislature for the specific right to construct a second tunnel beneath the East river for the conveying of gas from its plant, under construction at Berrian's Point, Astoria, L. I., to Manhattan Island proper. Many will remember the loud and prolonged howls that greeted and followed this application, prominent in the inciting thereof being many powerful newspapers, not only of the territory affected directly, but of almost every section of the State as well. Residents of other States, both far and near, could hardly fail of being impressed with the belief that this was a most iniquitous scheme, that bribery of the grossest sort was being indulged in with scarce any attempt at concealment, that the people were about to be defrauded of many "rights" of exceeding value, and so on *ad nauseam*. The fomentations eventually reached such a spluttering measure that the legislators, flocking under the banners of the brayers, rejected the enabling bill, and blatant honesty, to say nothing of sibilant virtue, was appeased. Ordinary proceedings, under the existing and applying statutes, were then commenced and carried out in orderly, waiting fashion, step by step through the various legal processes ordained, and now the end is reached which grants to the Company all, yes much than more, originally sought for by the highest judicial authority in the State. It is true that much valuable time has been wasted in the instance that, had the special act been passed at the outset, the tunnel would now be completed, ready to convey the product sought to be rapidly and readily transported for the better convenience and comfort of those whom the Company serves. The original intent of those behind the special act was for speed only, as the Company never once wavered in its belief that ultimately its right to proceed with the work was inalienable—time not saving was its need, not the desire to secure that which was lawful by bribery or brigandage, or aught that was illegal or improper. The line of the tunnel will be from Astoria, L. I., to a point somewhere between 100th and 120th streets, Manhattan, and it will be of a dimension ample to convey to the mainland of New York all the gas that its residents may ever demand. It would be a mistake to declare that all of the time, between the application to the Legislature for a special bill and the present, has been wasted, for the actual construction we imagine could be speedily gone on with, since the tentative plannings must have been completed long ago. It is a pity that originally, or when the proprietors of the New York and East River Gas Company planned the tunnel that has for years conveyed gas from Ravenswood, L. I., to Manhattan Island, the dimension of 10 feet by 7 feet was ever specifically named. But that is another story.

THE SEMET-SOLVAY COMPANY'S NAPHTHALINE SOLVENT.—This may have the appearance of an advertisement, but not a cent has been paid for it, nor in fact could it be bought. But as the naphthaline nuisance season is well upon us it looks in line to call attention to a remedy the virtue of which has been attested to us by engineers who

LIBRARY OF CONGRESS DEC 16 1907 SMITHSONIAN DEPOSIT.

would as soon think of denying their paternity as they would speak well of an agent in the shape of a commercial article for money payment. Since 1904 the Semet-Solvay Company's chemists have been busily engaged in perfecting a solvent for naphthaline deposits, especially where occurring in works' apparatus, holder inlets and the like. Early in the fall of 1906 the Solvay people put upon the market a solvent that met with considerable success, and which has been used regularly by many companies. The manufacturers, however, kept on experimenting, and last month they announced that an improved method of making the solvent had been hit upon whereby the dissolving power of the agent was materially increased. The liquid can be put directly into a plugged condenser, a drip or a holder inlet, or in vapor form by blowing steam through it. This vapor upon condensation carries down the naphthaline in solution, which runs into the sump, where it can be pumped out as a liquid. If these claims are not valid ones, our columns are open for testimony to the contrary.

A CANADIAN GAS ENGINEER OBJECTS.—VANCOUVER, B. C., Dec. 7, 1907: To the Editors AMERICAN GAS LIGHT JOURNAL: Recently I noted in the JOURNAL some comment on the views of an English gas engineer (now in America) on certain things respecting American gas practice, as communicated by him to the *Journal of Gas Lighting*. He said that some matters here in gas manufacture were behind the times. However, I see no reason or need for our taking alarm or for making changes in our practice. We certainly are leaving them far behind in yield per foot of retort; and as to durability of material, they are not in our class. We placed two new benches of retorts in old arches here in Vancouver 4 years ago—one English and one American, side-by-side. At the end of 1,000 days' continuous operation the English specimens were down and out, and replaced by American made retorts. The American bench, after 1,000 days' continuous operation, retained its shape perfectly, with only such repairs as patching inside retorts, and has started on its second 1,000-day period looking as though it would finish that out in fine style.—Yours truly, W. THOMAS, Superintendent.

CURRENT COMMENT.—

THE Jeffrey Manufacturing Company has opened a branch office in the Pierce Building, St. Louis, Mo.

THE first and second stories of the Parsons-Scoville Building, at Second and Sycamore streets, are being remodelled for the better office housing of the Evansville (Ind.) Gas and Electric Company.

MR. J. J. ROBBINS, who had been very prominent in the gas affairs of Wilkes-Barre, Pa., for several years, died at his home in that city the night of the 1st inst. He was in his 79th year, and perhaps to his energy the cities of Wilkes-Barre and Scranton owe more than to those of any other man. He is survived by his wife, one son and three daughters.

MR. JAMES J. GAFFEY, whose connection with the gas supply of Baltimore, Md., dated from his entering the service of the Consumers Gas Company in 1880, died in that city a fortnight or so ago.

THE new retort house recently completed for the Clinton (Ia.) Gas Light and Coke Company is declared by the Clinton *Advertiser* to be the "most complete structure of the kind in Iowa." Its capacity per day is 500,000 cubic feet, and its equipment was from plans by the Parker-Russell Company, of St. Louis.

MR. LOUIS D. KELSEY, General Manager of the Brookfield (Mo.) Gas, Electric Light and Heating Company, reports a most gratifying increase in business. In fact, the average for the year is well over 15 per cent.

AT the annual meeting of the Superior (Wis.) Water, Light and Power Company the officers elected were: President, Kenneth Clark; Vice-President and Treasurer, V. M. Watkins; Secretary, W. H. Winslow; General Manager, B. F. Ellison.

MR. HENRY SWARTZ and Mr. Charles Knoor have asked the City Council for a franchise to construct and operate a gas works in East Moline, Ills.

A CORRESPONDENT in St. Louis, Mo., writing to us under date of the 9th inst., says: "The gas plant at Abilene, Tex., was badly damaged by an explosion in the purifying house, caused by the gross negligence of a negro workman, who is said to have lighted his pipe in the room, while the man in charge was temporarily absent. Two were injured, the negro's injuries being quite severe."

[Continued from page i016.]

PROCEEDINGS AMERICAN GAS INSTITUTE, SECOND ANNUAL MEETING, HELD AT THE NEW WILLARD HOTEL, WASHINGTON, D. C., OCTOBER 16, 17 AND 18, 1907.

SECOND DAY—MORNING SESSION.

The Wrinkle Department—Continued.

No. 65.—*Method of Drying Coal or Coke.*—"In many places where the coal is very wet at certain seasons, or where the coke is marketed immediately after quenching, it is desirable to dry them quickly and cheaply before using. For this purpose I suggest that hot flue gases from the bench stacks be pumped through the bunkers or bins. The temperature of the gases can be regulated by means of an air inlet on the suction side of the fan. In many cases this method will quickly remove snow and ice from the coal and improve carbonizing results materially and also prevent unnecessary damage to the retorts."

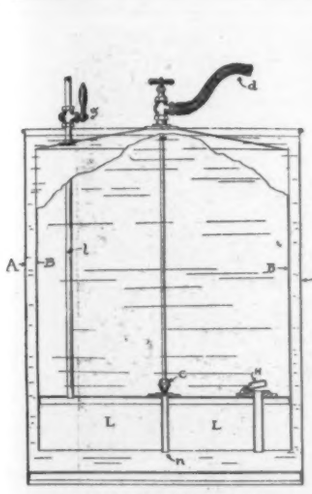
No. 66.—*Method of Compensating for Insufficient Condensing and Scrubbing Capacity in Water Gas Plants.*—"The use of a circular water spray around the inlet of the relief holder, with the result of forcing the gas through a thin sheet or spray of water, is of material assistance in removing the light tar vapors and in reducing the temperature of the gas. In the case of a relief holder, where the gas is being constantly mixed and moved, the use of water on the relief holder cover is often of material assistance in cooling the gas."

No. 67.—*Method of Using Cork in Purifying Material.*—"Attention has been called to the desirability of cork as a diluent for purifying material on account of its light weight and of the fact that it does not grind up and become small when handled. For this reason we have used the same cork many times by merely floating it off from the iron when the material becomes inactive. We have found very little loss in the bulk of the cork after years of service, during which it has been floated off from the spent oxide and mixed with fresh oxide as many as 12 times. On this account the relatively high first cost of the cork has been more than compensated for by its long life."

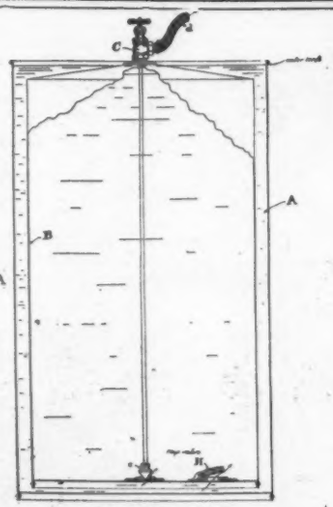
No. 68.—*Method of Measuring the Rate of Propagation of Flame.*—"A simple method of measuring the rate of propagation of flame for different gases consists in metering the discharge through a calibrated orifice and increasing the flow until the flame leaves the edge of the orifice. A lava tip can be used or a plain orifice will serve the purpose."

No. 69.—*Continuous CO_2 Sampling Apparatus.*—An apparatus for continuously withdrawing a small proportion of the flue gases from bench or boiler stacks is shown in the attached sketch. The closed tank *B* is placed in the open tank *A*. The sides of *B* extend below the bottom, forming an air chamber *L*. *C* is an angle valve with stem extended to work the disk at *c*. The flexible metallic hose *d* connects with a perforated pipe running through the stack. The tube *l*, in connection with cock *x*, permits of the air chamber *L* being filled or emptied as required. The pipe *n* prevents the air in *L* passing up into the tank *B*. To operate the apparatus, fill both tanks with water, with the exception of a couple of inches at the top of *B*, which must be filled with oil. Pump enough air into *L* to raise *B* several inches above the level in tank *A*, and regulate the opening at *c* so that the tank fills in the given time. It will be noted that, as the air chamber *L* rises, the pressure due to the head of water gets less and the air expands, tending to increase the upward pressure on *B*; also as more of the tank rises out of the water, the total weight of *B* increases. These two forces oppose one another, and if the tank is properly proportioned, they will balance, thus causing a constant flow of water *s* at any position of tank *B*. The advantages claimed by makers of automatic CO_2 recorders are that the firemen can see at any time the results obtained. These conditions can be approximated with the above apparatus by taking frequent tests until the fireman is trained to his work. In actual practice it is found that the average fireman soon learns how to get results. It is questionable if the average of a day's run, taken from a recording apparatus, is as accurate as that obtained from a sampling tank as above.—V. F. DEWEY, Detroit Gas Company.

No. 70.—*Sampling Tank for Gas.*—For photometric and calorimetric testing, it is often advantageous to get an average sample of gas passing through the main during a period of several hours or more. The ordinary method is to pass the gas into a sample holder, throttling the inlet to a point where the holder will fill in the given time. The



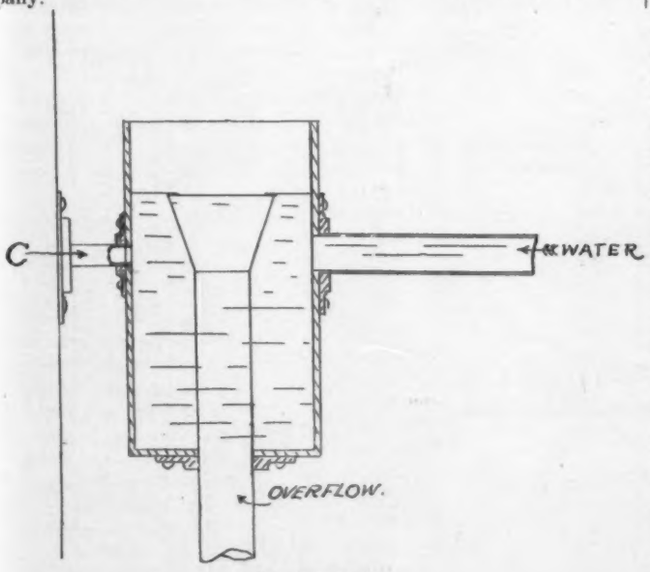
Wrinkle No. 69.



Wrinkle No. 70.

effect of wire drawing the gas through the small inlet is found to be deleterious to the candle power, and also causes the holder to fill more or less rapidly as the specific gravity of the gas changes. The sampling device shown in the attached sketch was designed to overcome these troubles. *B* is a closed tank placed inside of the open tank *A*. *C* is an angle valve with a stem of such length that the disk seats at *c*. The holder is connected with the sampling line with metallic hose *D*. *H* is a flap valve of large area. To operate, fill both tanks and turn gas on full; then adjust opening at *c* until the gas pressure forces the water from *B* to *A* at the rate required. The tank *B* will rise as it fills with gas, similar to an ordinary holder. Check valve *H* allows the tank to empty rapidly.—V. F. DEWEY, Detroit City Gas Company.

No. 71.—*Constant Water Level for Station Meters.*—With stationary meters running at variable speeds it is difficult to maintain a constant water level. The device shown in attached sketch, owing to the small opening at *C*, does not allow the meter to throw the water out at each oscillation in the drum, but is large enough to take care of any permanent change in the water level.—V. F. DEWEY, Detroit Gas Company.



Wrinkle No. 71.

No. 72.—*Continuous Record of Depth of Seal.*—The attached sketch shows a method of recording the depth of seal on hydraulic main. The end of pipe *Y* is placed flush with the bottom of the dip pipes; a small but continuous supply of gas is passed into the hydraulic through pipe *X*. The pressure on *Y* is equal to that on the dip pipes. —V. F. DEWEY, Detroit City Gas Company.

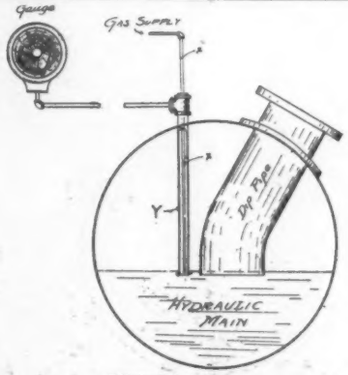
No. 73.—*Overflow for Hydraulic Main.*—The overflow shown in the attached sketch claims the following advantages:

1. The sides of the box *B* present a long edge for the water to pass over, thus permitting a large body of water to be pumped through the main without affecting the seal.

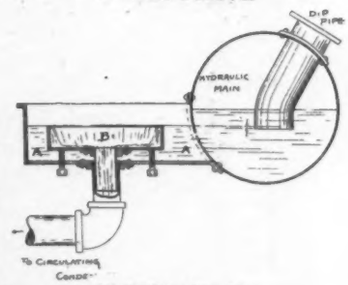
2. The overflow is open to atmospheric pressure, which makes the pressure on the retort entirely independent of the vacuum drawn by the exhauster (providing the changes of vacuum are not too sudden and the circulating water supplied the main is ample).

With above conditions the level of the water in the main will rise and fall proportional to the vacuum, but the pressure on the dip pipe will vary only with a change of the height of the overflow.

It is found to be perfectly safe in practice to carry a high vacuum on the main, which more thoroughly washes and cools the gas by passing it through a greater depth of water.—V. F. DEWEY, Detroit City Gas Company.



Wrinkle No. 72.

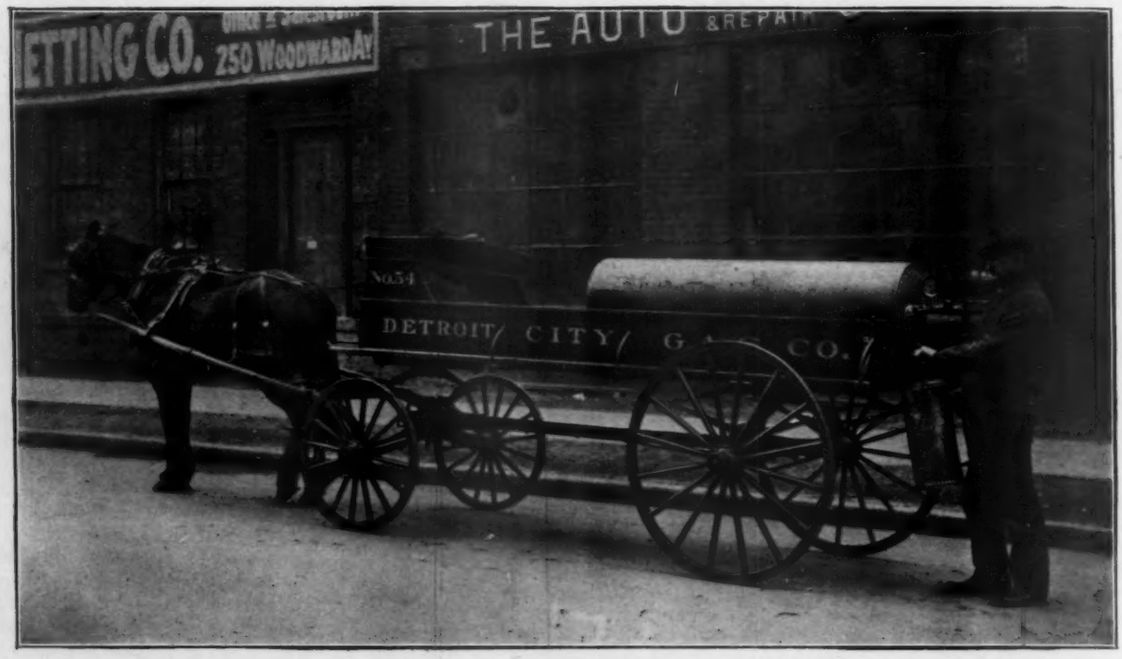


Wrinkle No. 73.

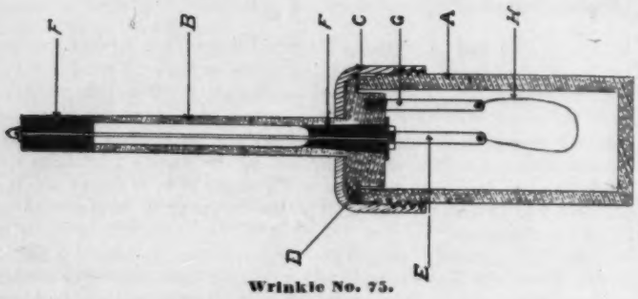
No. 74.—*Method of Cleaning House Piping.*—This method consists in using compressed air for cleaning house services. The air (or gas) is compressed into a main storage tank to about 200 pounds pressure, and delivered from this tank to a wagon tank carrying about 140 pounds pressure. From the wagon tank the air is drawn into small tanks, such as are used for air brakes on street cars. By means of this plan two men with a wagon will average 15 to 16 cleans per day, against 9 or 10 with the old hand pump.—GARNET W. MCKEE, Detroit City Gas Company.

No. 75.—*Total Sulphur in Oxide.*—Where a frequent determination of total sulphur in oxide is made, the following method will be found equally accurate and more rapid than the ordinary extraction, or slow oxidation method. A bomb similar to the accompanying cut is needed, may be easily made, and should be of brass. *A* is bored out of 1-inch brass and threaded for the lock nut *C*, which draws *B* down on the gasket *D*, making the bomb gas tight. This gasket, *D*, may be of any suitable sulphur free material. The post extends through the shaft *B* and must be insulated at *F*. *G* is a second post, screwed into *B*. *H* is an ordinary 64-gauge iron wire, which serves to complete the circuit, when 3 or 4 dry batteries in series are attached by contact on *E* and any point on *A*. To make a determination, place in the bomb about 10 grams of sodium peroxide; add ¾ gram of an oxidizing mixture composed of 11 parts boric acid, 4 parts potassium chlorate and 1 part magnesium oxide, ½ gram of the dried and pulverized oxide, and ¼ gram of naphthaline or ½ gram of pulverized coal whose sulphur content is known. Mix thoroughly. Close bomb and explode charge by closing the circuit as before stated, taking the precaution, however, to immerse the bomb in about a quart of water, otherwise the bomb is liable to fuse from the heat generated by the rapid combustion. After cooling, open bomb, dissolve out charge with hot water and precipitate the sulphur by the usual method. The total time required for operation up to the point of precipitation with barium chloride is not more than 10 minutes. With proper modification, this method is applicable for the estimation of total sulphur in any combustible substance.—R. M. REDDING, Chemist, Laboratory N. O. Gas Light Company.

No. 76.—*Device to Maintain Constant Operation of Ammonia Scrubber Pump.*—Lever of throttle valve marked *A* is attached to float in overflow pit by means of cable, which passes over pulleys *B-B*. Counterweight *C* is attached to end of cable. Liquor flowing into overflow pit is pumped into primary scrubber. As level of liquor changes in pit the float acts on lever of throttle valve, causing same to open or close, thus maintaining a constant working of pump.—H. E. MANN, Cleveland Gas Light and Coke Company.



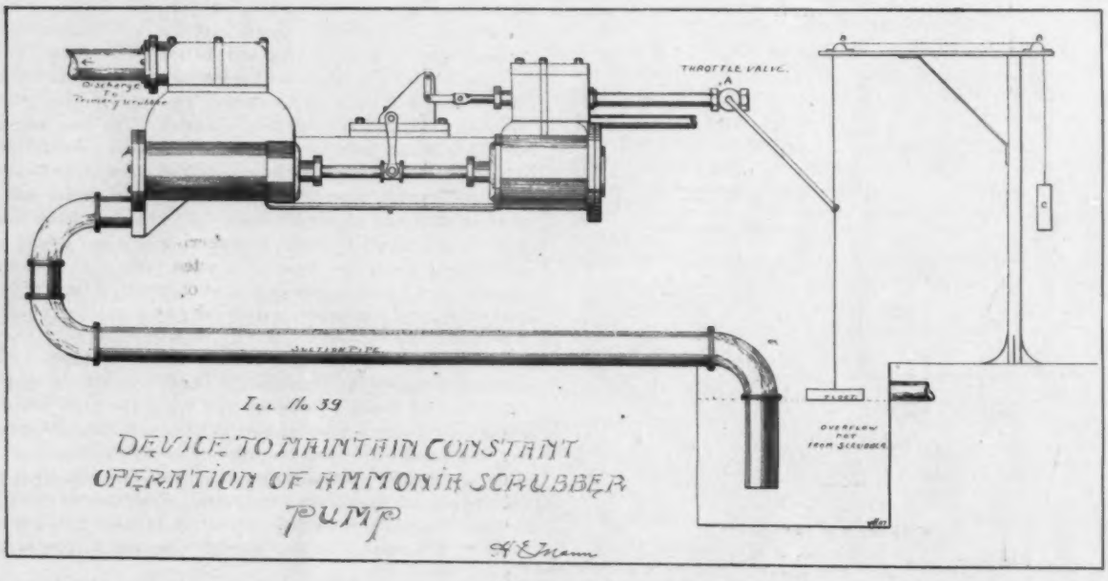
Wrinkle No. 74.



Wrinkle No. 75.

Mr. Bump for the work which he has done in collecting wrinkles, and that he be continued as Editor of the Wrinkle Department. All in favor say "Aye." Contrary minds, "No." It is carried. The next business is the report of the Committee on Methods of Taking Candle Power of Gas, Mr. W. H. Gartley, Chairman. Mr. Gartley, how long will it take to read your paper? I ask that question because we can interrupt the discussion, but I would not like to interrupt the reading of the paper. Perhaps it would be better to summarize the paper.

Mr. W. H. Gartley, in prefacing the



Wrinkle No. 76.

The President—Gentlemen, you have heard the report of Mr. Bump for the Wrinkle Department.

A Member—Mr. President, I move that we accept the report which Mr. Bump has submitted, that we extend him the thanks of the Institute for his work, and that he be continued as editor for next year. [Motion seconded.]

The President—The motion is that the Institute extend its thanks to

REPORT OF THE COMMITTEE ON METHODS OF TAKING CANDLE POWER OF GAS,

said: Mr. President and Gentlemen—This report occupies a good many pages in the printed book, and those of you who have read it or who will read it, will see that the Committee has not attempted to lay down any hard-and-fast rules as to the method of taking candle power of gas. That was a condition which it would be hardly fair

for the Institute to impose upon us, and the Committee did not think it was called upon to attempt it. The report is intended to cover step by step how a proper photometric test should be made. It is shown what kind of a room the photometer bar should be installed in, and what is generally requisite for the installation of a photometer. While the report does not recommend the adoption of any one standard, it has presented the facts regarding the well-known lamps and others in such a way as to assist in making a wise selection. The question of a standard is a very important one. The report does not offer very much encouragement to those men who believe that the proper way to make an accurate determination of candle power of gas is by a pair, or half-a-dozen pairs of any standard candles. It has endeavored to point out, however, that the candle itself is an unreliable standard. The question at this day is becoming more and more acute. Gas companies are being called upon to deliver a certain number of candles of a fixed candle power, and they are, in a great many instances, subject to penalties if they do not do it. We hope that the report of the Committee will assist the inspectors of municipalities and State commissions to get an installation of the proper instruments and proper detail of apparatus, then to take the readings in a proper way. The Illuminating Engineering Society has taken the initiative in endeavoring to fix upon a value for the unit of light. That is something which everyone, it seems to me, needs. It is nearly time that we should agree. The International Photometrical Committee, which met this year in Zurich, has done some work along that line, and has arrived at some conclusions. The intention is that the Institute and Associations interested in the subject of municipal lighting, shall appoint representatives to a committee who will consider the whole subject of getting up or adopting a definite unit of illuminating value. I want to read a portion of the report which refers to that. That portion will be found on page 72. [See paper under the head of "The Unit," down to Appendix A.] I want to say it is not proposed that the gas companies will take a low voltage electric light and use that as a standard for gas at all. Of course, there is a difference between the two. Such a course would only give confusing results, because, while the gas flame would be influenced to a marked degree by changeable atmospheric condition, the electric lamp would be unaffected. It is intended that the flame standard against which the gas is to be compared will be given a value by taking it to a laboratory in which it may be compared against a standard electric glow lamp, the flame standard being burned in a normal atmosphere, or in an atmosphere of known water vapor and carbonic acid content, from which its value in a normal atmosphere might be calculated. The electric glow lamp having had its value fixed in multiples of the unit of light, by comparison with the standard lamps in possession of the Bureau of Standards at Washington, and your flame standard lamp having been given a certified value in terms of the unit, you have a standard against which to compare your gas that will be influenced by changes in atmospheric conditions almost exactly to the same degree as the gas flame. I want to say that the committee is under a great many obligations to the Bureau of Standards at Washington. Dr. Hyde, who was in our laboratory at Philadelphia, conducted a series of experiments regarding the pentane lamp which showed the effect of these atmospheric conditions on the pentane lamp. The experiments conducted there were such that they led us to carry on some more extended experiments with better equipment which he suggested to us, and the results are found in this report. I do not think it is necessary to take the time further.

The report of the Committee is as follows:

Room.—Your Committee on Methods of Taking Candle Power of Gas recommended that, for continuous and accurate testing and for convenience in operation, the photometer room in which the 60-inch bar photometer is installed should not be less than 14 feet 9 inches long when gas from one supply is to be measured. Where gas from more than one supply is to be measured, a separate meter for each supply should be provided. (See photometer meters.) For each additional meter set upon the extended photometer table, add 1 foot 6 inches to the length of the photometer room. The width of the photometer room should be not less than 8 feet 6 inches. The height of the photometer room should be not less than 12 feet. These dimensions as to length and width are the least that will permit of convenience in movement about the photometer, the table of which is to be 8 feet 9 inches long and 2 feet 6 inches wide, when a single meter is used. The minimum height of 12 feet is given from considerations of ventilation.

(To be Continued.)

[Concluded from page 1025.]

PROCEEDINGS, FIFTEENTH ANNUAL MEETING, MICHIGAN GAS ASSOCIATION, HELD IN BATTLE CREEK, MICH., SEPTEMBER, 1907.

THIRD DAY—CONCLUDING SESSION.

The President—We will now discuss the report submitted by Mr. Russell yesterday from the Committee on the Prevention of Accidents in the Manufacturing of Gas.

[For the text of the Report, see *ante*, page 1018.]

Discussion.

Mr. Douglas—What does Mr. Russell mean by wire mesh for elevator shaft?

Mr. Russell—It is in the nature of an expanding metal of Babbit-like structure. It is open, with a mesh of about ¾ to 1 inch. They put it in the elevator shaft, running it up the whole length. I have some here which I will pass around.

Mr. Douglas—Do you think the mesh would be preferred for sheeting up inside of the shaft?

Mr. Russell—How would you sheet it?

Mr. Douglas—With wooden sheeting.

Mr. Russell—I do not believe in wooden sheeting. An objection is that it makes your elevator shaft dark. By using this open mesh the light passes right through, so you do not have to put in electric lights. It also lets out the steam and hot gases. If you use wood you are apt to have a dark, dirty hole. You put the mesh right over the window and cover any opening. Of course, the idea is to use it as far as you can, but not in impossible positions. We all have safety devices in use, and I think if each man would tell of a few he is using and the protection they afford him it would add to the discussion.

The President—Mr. Sinsel, can you add anything to this discussion? Some of the things you had charge of when they were installed in Detroit might be of interest here.

Mr. Sinsel—The extension of the valve on top of the boiler is one of the most interesting things that we put in use there; that is, placing an automatic stop valve to cut off the elevator in case anything happened. I do not know of anything else, except the guard rails.

The President—One thing I might mention that Mr. Sinsel did not bring out, is that we employ the Otis Elevator Company, at $25 per year per elevator, to inspect our elevators (once in 2 weeks) thoroughly. I do not know how many are doing that, but the Otis Elevator Company in any town has a regularly organized inspection and repair department. It will pay you to get that service from them, because it is cheap and efficient. Do you do that in Rochester?

Mr. Russell—We have not, although I think it should be done. The factory inspection laws system is pretty rigid in New York State. They visit us two or three times a year on our elevators, look after them pretty carefully, and keep us in pretty fair line. Even at that, I am a strong advocate of elevator inspection by people who are in the business and know what they are doing. They will save you money in accidents.

Mr. Sinsel—Mr. Russell in referring to the lighting of a plant makes it evident that he is connected with a company having electricity to burn. His idea is in favor of electricity altogether. Around a gas manufacturing plant I think gas should be used as much as possible. In fact, I think it possible to use gas in nearly every case, except perhaps in the purifying plant. We have wall lights around our purifying houses in Detroit, and have eliminated electricity, especially at Station B, from all our buildings, except the boiler room. I think it will be out of there as soon as we have placed certain safety devices in the water gas set. Being in the gas business, we should burn gas, especially around our own premises, all the time.

The President—I think everybody will agree with that.

Mr. Russell—I do not agree with it entirely. Of course, I am connected with a company which is electric too. I have found it cheaper, by easily one-fifth, to light with electricity. We get good light. We have duplicate service in case of trouble, but have had very little of latter. We light our retort houses, our yards, and every other part of our plant, with electricity. If you use electric light in your purifier house you have the system in anyway, and while I do not think it is practical for old companies to use electric light, I do think it is safer and the best way to light your plant, even if you are in the gas business. You know what it is to try and light a retort house with gas. The average stoker, wanting a big flame, breaks off the tip. You get a ¾-inch pipe burning full but giving no light. In spite of anything that you can do, you are going to have

that condition. If that is an advertisement for our business of gas lighting, on going into a plant and finding that condition you should change your methods. If the electric light is prohibitive, why certainly, light with gas.

Mr. Sinsel—If Mr. Russell would put one of his electric arcs in our Station B retort house I venture you could not see the electric arc. Of course, the house is ventilated and lighted along the plans he proposed in the report. It carries dust and dirt. We have a bright light, and one can pick up a pin in any place in the retort house.

Mr. Russell—The next time I am in Detroit I will go to Station B and see those lights, but I suppose by that time Mr. Sinsel will have all the globes cleaned up and the mantles all fixed; in fact, have them in perfect working order; wherefore I will be able to find those pins that he is talking about. I do not like to give him away, but I had occasion to go to Delray with Mr. Dewey, who has his wall lights installed in the purifying and pumping plants and in the boiler room. About the first thing I heard when I got into that plant, from one of the men, was, "Well, Mr. Dewey, I wish you would give us more light in this building." Your President asked, "What is the matter with the wall lights; aren't they all right?" "Well, they do not give us light where we want it; they do not light up the lubricators; we can't see at night; that gauge is too far away from that wall light; I cannot read it at night." His reply was: "If you get your mantles fixed up on those wall lights, or put new ones in there, thus getting them to burn properly, you will have all the light you need." And that happened in Detroit, you know, where gas light is used.

Mr. Ewing—In Detroit we have 1,500 outside gas arcs in use, and I will match them right beside any other kind of outdoor light that there is. We will give you more light and better light, for less money, even if you make your own electric current. Mr. Russell may not be easily convinced, but I will try and convince you, if you have a job where we can get some revenue. As far as lighting the works is concerned, I think Detroit can show a well lighted retort house, and, with everything considered, we can argue Mr. Russell out of his electric light. I think if he has the say, before we get through, he will change and put gas arcs in his own retort house, instead of using something else; and do not forget that the gas man does not care anything about the cost. What he wants is light, good light, and a light that is always with him. I will be glad to undertake that job, Mr. Russell, if you are open to be convinced. [Applause.]

Mr. Douglas—The great trouble with the gas arcs in retort houses is that in most cases they are not taken care of. If they are given the same attention that your customers' lamps get they will be right. You cannot leave them for 3 months and expect them to be clean.

Mr. Lloyd—Is this a discussion on safety appliances or new business? [Laughter.]

Mr. Ewing—We could not let a thing like that go by.

The President—It is on lighting retort houses safely. There are a good many things that have not been touched on that I think are questions of practice. People have open retort houses that would not do for a northern climate. I do not think it is either practicable or possible to conduct our present retort houses with the present methods of operating retort houses, in the winter time. Personally I would not advocate to anyone who contemplates putting up a retort system, unless that system was housed. The work at the Solvay Process Company is not analogous at all there. There are very few men employed in taking care of coke ovens; it is absolutely all done by machinery. Retort house men are not afraid of the heat. What they are afraid of is the cold.

Mr. Russell—I think if Mr. Dewey were in Rochester, he would change his opinion about the men not being afraid of heat. They are afraid of it. This retort house proposition is largely my own idea, and one to be thought of. When building your retort house, go as far as you think you can, but go pretty well along that line. I would like to hear Mr. Blauvelt, speaking about coke oven practice, tell how much the men have to work out in the open and so forth.

Mr. Blauvelt—I never before heard such an enthusiastic statement with regard to the small amount of labor to operate coke ovens as I heard given just now. It seems to me I would like to get Mr. Dewey in the coke oven business. They have 2 doors, each 7 feet high and 2 feet wide, that have to be closed up gas-tight once in every 24 hours. We have a standpipe that has to be cleaned out 2 or 3 times every charge, and we have from 3 to 5 charging men on top of the ovens that have to be covered. There is also some work in connection with firing the ovens, and in every plant, no matter how small, the entire time of 1 man is occupied with that. In other plants it may run up to 4 or 5 men, so that of the total number of men employed in operating a retort oven about 66 per cent. are outdoors. Our engineers, the by-product men and the ammonia distillation men, are indoors. The coke-handling is partly outdoors, but that is mostly inclosed in modern plants. I will say that is the only criticism that has been made of retort oven practice in northern climates that it is all out-doors, and it has been suggested sometimes that an investment in a building to cover the plant would probably pay for itself, especially as a temporary building has to be erected when the plant is being built, and by doubling that investment you would have a fairly permanent building. I think the better practice was to leave them uncovered, making the construction such that the weather could not hurt them, then dress for cold or rainy weather. One objection to its being entirely exposed, applying to retort house, that possibly you have not considered, is the effect of high winds. You cannot build a brick structure that the wind will not get through; but, speaking entirely as an outsider and as a layman, I must confess that the retort house looks like an unnecessary investment. I believe most of the difficulties you think of would be found not serious in practice, and you would find there was probably less complaint by the men on account of exposure to cold weather than there is in the closed house on account of the foul air and suffering from the heat in the summer time. However, my information on the matter, you know, is not of a nature that should cause it to carry very much weight.

The President—In closing this discussion I want personally to thank Mr. Russell for this report, and also to extend him the thanks of the Association. The work has been enormous, and while it probably is not in as condensed a shape as it would have been if double the amount of work had been put on it, at the same time he has given every spare moment to it. I think we all can apply it to our plants in such manner as to give it a great deal of force. We will now have the

Report of the Nominating Committee.

Mr. Douglas - The Committee on Nominations beg to report in favor of the election to office of the following named gentlemen:

For President—Mr. D. H. Frazer, of Battle Creek.
For Vice-President—Mr. James T. Lynn, of Detroit.
For Secretary and Treasurer—Mr. A. P. Ewing, of Detroit.

The report was accepted and adopted and the result declared.

The President—We will now hear from the

Committee on President's Address.

To the Members of the Michigan Gas Association: Your Committee on President's Address have considered at length his most excellent contribution. Most of the subjects mentioned have already been discussed by the Association. It is obvious that the cost of manufacture is steadily increasing, due to advances in the cost of labor and materials, which state of affairs must be met not only by increased sales but also by decreased expenses at the plant. Little has been done in small and medium sized plants to reduce labor costs, and we believe that this subject could, with advantage, have the consideration of the Association. A comparison of wages paid and work done by works' employees could also be treated to advantage, and we recommend that papers on these subjects be prepared for the next meeting. Nothing has been mentioned respecting affiliation with the American Gas Institute, and as we believe that this subject should be considered by the Association, we recommend that a committee be appointed to consider this matter and report at the next meeting.

The President—What will you do with this report. It suggests the appointment of a committee to consider affiliation with the American Gas Institute. What will you do with the suggestion?

Mr. Douglas—Your committee making this report did not feel at all sure that we wanted to affiliate to any greater extent than we have already. As I understand, the plan of affiliation with the American Gas Institute contemplates considerably more than we have done. It contemplates a membership in some form—I do not remember exactly what - of all members of this Association with the Gas Institute, which entitled the members to the "Proceedings" of the Institute, and there are a number of other things. We were not at all sure it was a desirable thing to do, and as the matter has been put before the various Associations by the Gas Institute, we felt we should consider it in some form or other.

The President—I think it would be perfectly proper to have such a committee appointed. If I remember rightly, Mr. Lloyd was our President at the time the American Gas Institute was originally projected, and if you wish a committee I should like to see Mr. Lloyd a member thereof, if it is the pleasure of the Association.

Mr. Lloyd—I do not remember whether it was during the year I

was in office of President, or whether I was on the Executive Committee, but I know I attended a conference in Detroit at which a committee was appointed on which were Mr. Douglas, and I think Mr. Cobb. They are familiar with the original proceedings, and I would offer the suggestion that they would probably serve us better than any others that could be named.

COMMITTEE ON INSTITUTE AFFILIATION.

Mr. Frazer moved that such a committee be appointed. [Seconded by Mr. Traver.]

The President put the motion, declared it adopted and named as the committee, Messrs. H. W. Douglas and B. C. Cobb, with instructions to report at the next meeting.

SCHOLARSHIP COMMITTEE.

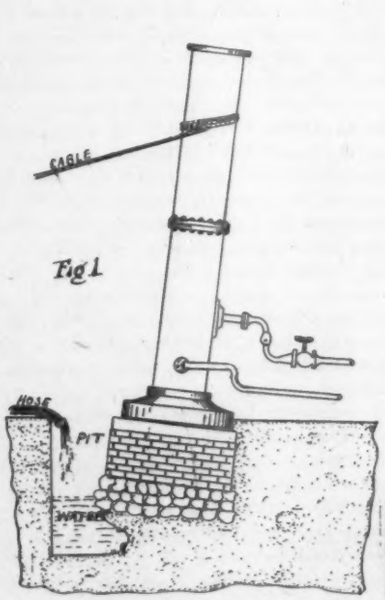
The President – In talking to Mr. Lynn about the Scholarship Committee, his understanding is that it is a permanent committee. As far as I can see there is nothing in the Constitution or the amendments thereto that concern the gas scholarship or the fellowship work. Personally, I cannot see where Mr. Ewing gets his idea that it is the Executive Committee. This was by vote of the Association last year, and the Executive Committee, as I understand it, has nothing to do with it. Of course the filling of vacancies would be a different thing; but if this is a permanent committee, the Executive Committee has nothing to do with it.

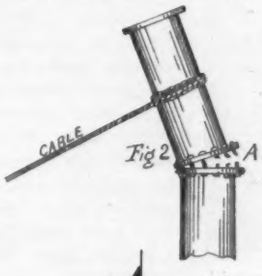
Mr. Ewing – That committee had the appointing of that committee, however.

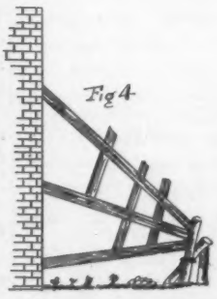
Mr. Lloyd – As there seems to be doubt over the precise terms of the original resolution or recommendation, I move that the matter of the Scholarship Committee be left to the incoming Executive Committee, with power to act. [Seconded and adopted.]

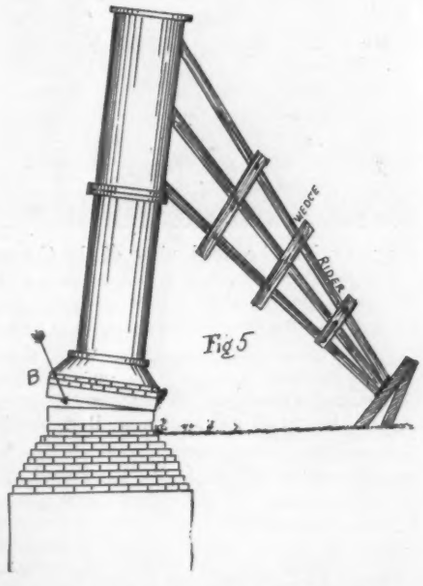
Mr. Douglas – I should like to move the thanks of this Association to the Battle Creek Business Men's Association for the use of these rooms, which I think the best and finest we have ever had at any meeting of the Association. Also, to Mr. Frazer for the many courtesies which he extended to us. [Adopted.]

The President thereupon declared the convention adjourned.









Straightening Deflecting Pipes.

Prepared for the JOURNAL, by "ENGINEER."

Occasionally it is necessary to straighten a single gas pipe or a system of such pipes used as standpipes. Fig. 1 is a side elevation of a plan which was used recently in straightening a leaning pipe, which pipe rested upon a foundation laid in "muggy" soil. A cavity was excavated and packed with stone and pieces of rock, and brick was laid thereon as a foundation. Next came a concrete be', on which the flange of the pipe was fitted. Various conditions made the whole outfit lean over as represented. Many processes of straightening the standpipe were undertaken; ropes and windlasses were rigged up and trials were made to pull the thing back into a vertical position without avail. Then someone hit upon the plan of making the soil spongy on the inner side of the foundation, causing the earth to become pliable. An excavation was made as shown, at the pit, which pit was flooded with water, the latter being allowed to filter into the soil until the latter became soft. The muddy condition having made it possible to loosen up on the side, the draft-cable was affixed near the top of the stack and a steady strain was put upon the cable by means of weights on the other side of a wheel over which the cable ran. Hence, with the mushy soil on the inner side and the steady draft on the stack by the rope, the whole thing was gradually and slowly pulled up into line, after which the filling was tamped and the job was complete.

In recent years resort has been had to ingeniously constructed cantilevers or shoring contrivances for effecting the same end more rapidly and without the digging of pits. At one place where they undertook to do the work in a hurry, by drawing heavily upon a rope attached to the upper section of the pipe, the upper section of the pipe was broken off, as illustrated at *A*, Fig. 2. It is possible to secure a very decidedly strong pull on a standpipe if a windlass operated by an engine is used; then, unless the rope breaks, something must go. If the stack will not straighten up, a part of it must succumb, as happened in this instance. Therefore, more scientific methods are in vogue for the straightening of leaning pipes. Plans are used for shoring, needling and underpinning. The operation of shoring a tilted pipe is not difficult. You require some pieces of timber, about 2 by 2, or 2 by 4, and of sufficient length to reach the designated points on the object to be operated upon. These pieces of timber may be designated as needles, the pieces extending crosswise with the needles are struts, and the wall holders or pipe holders can be anything that will suffice to afford a bracing point. You will also need some cleats and butts. There are several types of needle combinations, known as the 2-needle, 3-needle and 4-needle form, and the 3-needle form is used in most cases. The dead shores have to be braced and cleated, and the construction of the affair is not difficult.

Fig. 3 shows a plan of shoring the side of a structure, which in this instance was a gasoline tank that had settled upon its foundation and tilted to one side. In order to restore the tank to the correct level the system of sliding shores was erected as per the plan. The base butting was obtained by sinking a number of posts into the earth, the system of needles was shored up, and the gradual strain thus brought upon the side of the tank forced it over and into proper line.

Fig. 4 shows a similar operation of shoring a brick edifice in position, which edifice was used for storage. The gas tank used in connection with a calcium light equipment had bulged just enough to force over the sidewall of the edifice. The 3-needle shoring device was constructed and the braces put in as shown, and it required but a few hours of the strain to push the wall over to the required alignment. A great deal of expense with loss of time is saved by using shoring devices in such instances.

Fig. 5 is a drawing of a plan involving the application of another 3-needle shoring apparatus. In this case a strong wind had unsettled a standpipe, and some of the bolts connecting the pipe flanges at the base were broken, as at *B*. The flanges were opened enough to make this a danger point. The shoring contrivance was made with 2 by 4 needles and the latter were properly adjusted with the wedges and cleats. The standpipe was forced over and into a vertical line in a very short time, then the broken bolts were removed from the flanges and new bolts put in, after which the flanges were rebolted and the pipe remained fixed in permanent position. In connection with the outfit of shoring contrivances it is a good idea to carry an equipment of blocks and tackles, which will be found very useful in restoring any pipe or wall in line in connection with the shoring outfit. With the shoring outfit on one side effecting a pushing force and the block and tackle on the other effecting a drawing force, you can move objects quite readily.

Long Distance Snapshot of the Largest Gasholder in the World.

Some days ago Mr. H. T. Owens, of the Public Lighting Department, city of New York, had occasion, in the course of the duties of the department, to visit the western section of Queens county, L. I. While driving over the hill to the east of North Beach, at a point 1¼ miles distant from the Astoria Works of the Consolidated Gas

Company, he got a good view of the Company's 15 millions cubic feet capacity gasholder, at a time when it was ⅔ inflated. Having his camera in the wagon he availed himself of the opportunity to "take" the holder, with the result shown in the picture.

Chemical Changes Occurring During Carbonization in Horizontal, Inclined and Vertical Retorts.[1]

[A presentation of this subject by HAROLD G. COLMAN, Ph.D., M.Sc., at the November meeting of the Manchester and District Junior Gas Association.]

On thinking over the question of a subject for the lecture your Committee kindly asked me to give to this Association, it appeared to me that it might be advantageous to devote the time to some considerations having a bearing on one of the most important questions now before the gas industry—namely, the carbonization of coal in vertical retorts. The time available does not, of course, allow of an exhaustive treatment of the subject in all its relationships, whether of a chemical, engineering, or commercial nature. I propose, therefore, to confine myself, in the first place, to a general consideration of the chemical changes occurring in the carbonization, and, in the second place, to the manner in which these changes are modified, according as the carbonization is carried out in horizontal, inclined, or vertical retorts. Originally, I hoped to extend the discussion to the question of carbonization of the coal in larger bulk, as in coke ovens; but I soon found that it would be impossible and inadvisable to do this within the limits of a single lecture.

1. From *Journal of Gas Lighting.*

As you are all aware, the changes which take place when coal is heated in the absence of air, are of an extraordinarily complicated nature, and result in the formation of hundreds of different compounds—some solid, some liquid, and some gaseous at the ordinary temperature; and at present we are far from possessing a complete knowledge of the exact manner in which the formation of these numerous substances takes place. Nevertheless, though such detailed understanding is by no means achieved, the knowledge gained during the past hundred years, both in the laboratory and in the practical working of carbonization on the large scale, has enabled us to come to certain general conclusions which are of the very highest importance to gas makers—*i. e.*, to those whose first object is to obtain from a given amount of coal the maximum quantity of gas of suitable heating and illuminating power for general distribution as a source of light, heat, and power.

The essential constituents of coal are carbon, hydrogen and oxygen, and, in addition, the elements nitrogen and sulphur are always present in smaller quantity, as well as a varying quantity of mineral matter, which is left behind as ash when the coal is completely burnt. As an example of the composition, an analysis is here given of a sample of Derbyshire gas coal of good quality, and containing only a low percentage of ash and sulphur:

Carbon	79.85	per cent.
Hydrogen	4.84	"
Oxygen	10.96	"
Nitrogen	1.23	"
Sulphur	0.72	"
Ash	2.40	"

The percentage of the constituents naturally varies to a considerable extent in the different varieties of coal.

In considering the action of heat on such a coal, it will be convenient to deal first of all with the carbon and hydrogen only—these being the most important constituents from a gas maker's point of view; leaving the discussion of the changes taking place with regard to the other constituents until later. When the coal is heated in the absence of air, it splits up into two portions—(1) a solid non-volatile portion, which remains in the retort as coke, and (2) a volatile portion, partly liquid and partly gaseous at the ordinary temperature—tar and gas. It is an invariable rule that the volatile portion contains a larger percentage of hydrogen and a lower percentage of carbon than the original coal, and that exactly the reverse is the case with the solid residue. When the temperature employed is the lowest at which decomposition of the coal takes place, which is well below a red heat, it is found that the volatile portion consists mainly of hydrocarbons which are liquid at the ordinary temperature, and that, working under these conditions, only a small yield of rich gas is obtained, consisting mainly of marsh gas (CH_4) and ethylene (C_2H_4) with smaller quantities of hydrogen, and that a large quantity of tar is formed; the latter consisting, for the most part, of liquid hydrocarbons of the paraffine and olefine series, which have the composition represented by the general formulæ $C_n H_{2n+2}$ and $C_n H_{2n}$—*i. e.*, of substances which contain at least twice as many hydrogen atoms as carbon atoms in the molecule. The tar thus obtained is, in fact, closely similar to the naturally occurring petroleum oil, which has probably been produced in a somewhat analogous manner by the distillation of organic matter beneath the earth's surface. The residue of coke obtained at such temperatures still contains large quantities of hydrogen which can be driven off by further heating, and this residue is a twin brother of the much discussed "Coalite."

Where it is desired to obtain a residue of this kind still containing hydrogen, or where the object is to manufacture hydrocarbons like petroleum from the coal, as in the Scotch shale-oil industry, the employment of such low temperatures is favorable; but for gas making purposes it is obvious that these are useless, and that higher temperatures must be employed. When the retort is heated to a greater extent, the coal only rises in temperature gradually, and first it undergoes the above low temperature decomposition. But the further action of heat brings about new decompositions, both in the above hydrogen containing residue and in the volatile matter first produced, and although these changes take place simultaneously, we may, for convenience, consider them separately.

The effect of greater heat on the low temperature coke is to decom-

pose it further and to drive off additional quantities of hydrogen, which at this temperature is evolved chiefly as marsh gas, and in the elementary condition; so that the product now formed by the further decomposition of the residue is chiefly a permanent gas. At moderate temperature—about a dull red heat—a considerable additional amount of hydrogen is thus driven off and the coke becomes harder and denser. But even then the hydrogen is far from completely eliminated. A further increase of the temperature to the highest attainable in practice results in the evolution of still further quantities of gas, which also consist mainly of marsh gas and hydrogen. But as the temperature rises, so the percentage of marsh gas in the gas given off rapidly decreases, while that of free hydrogen increases, and the coke simultaneously tends to become still harder and denser. It will be seen, therefore, that the higher the temperature to which the coal is finally heated, the greater is the yield of combustible gas which is obtained from it.

Now let us turn to the further action of heat on the volatile products. We have seen that while the coal is only at a low temperature during the precess of heating, it is giving off petroleum-like hydrocarbons, which are useless to the gas maker. When the retort is more highly heated, these petroleum-like products undergo further decomposition if subjected to this higher heat before they can pass out of the retort, and at temperatures rather above a red heat split up, yielding a still more volatile portion, consisting of substances which are gases at the ordinary temperature. The most important of these are hydrogen, marsh gas, ethylene and benzene. The latter, it is true, is a liquid at the ordinary temperature, but is so volatile that the great bulk of it is retained in the gas.

On the other hand, simultaneously with the formation of these gases, the petroleum hydrocarbons yield many substances less volatile than themselves, consisting of hydrocarbons of the "aromatic" series—such as benzene, naphthaline and anthracene derivatives—which contain a much higher percentage of carbon and a lower percentage of hydrogen than the petroleum hydrocarbons from which they are formed. These are liquids at the ordinary temperature, or if solid (like naphthaline and anthracene) are soluble in the other liquids, and condense together as a fairly thin tar in the subsequent cooling of the gas. By subjecting the volatile products to such a temperature, therefore, the yield of permanent gas from them is greatly increased, and that of tar diminished; and the tar itself consists of a different series of hydrocarbons, which are of especial value for the coal tar industry, although, owing to the fact that they are now produced in quantities exceeding the demand, the commercial value of them to the gas manufacturer has greatly diminished.

If, however, the volatile products are subjected to the action of still higher temperatures before leaving the retort, such as a bright red or white heat, further decompositions take place, which, on the whole, are by no means favorable to the production of gas. The tar vapors of the aromatic series undergo further decomposition into still denser hydrocarbons and a gas consisting mainly of hydrogen, and many of the new hydrocarbons formed are solid, even at a red heat, and quite insoluble in the other tar. These are partly deposited on the heated walls, as "carbon" or "scurf," and partly carried out of the retort with the hot gas as finely divided solid particles, and separate on cooling with the tar, making it much more viscous, even when hot. Moreover, the true gaseous products themselves at this temperature undergo further decompositions; the benzene vapor being converted into hydrogen and substances which condense in the tar, while the ethylene yields hydrogen, marsh gas and tarry matter. Even the marsh gas, which is the most stable of the gaseous hydrocarbons, undergees partial conversion into hydrogen and tarry matters, and perhaps free carbon.

It appears, therefore, from these considerations, that, while in order to obtain the maximum yield of gas from coal, it is advisable to subject the latter finally to as high a temperature as possible in order to drive off the maximum quantity of volatile matter from the coal, the gases and vapor produced in the distillation should only be subjected to a considerably lower temperature than that to which the coke is eventually heated, as too high a temperature results in the deposition of carbon which would otherwise have remained in the gas, and which is deposited either in the retort or in the tar—thus depreciating both the calorific and the illuminating power of the gas. On the other hand, it is equally evident that these volatile products must not be exposed to too low a temperature, for in that case the liquid hydrocarbons produced in the early stages of distillation would not be sufficiently decomposed, and would be largely lost from a gas making point of view—being condensed in the tar.

Now let us turn to the fate of the other constituents of the coal during carbonization—the oxygen, nitrogen and sulphur. The ash, of course, all remains in the coke, and need not be further considered. Oxygen is contained in the coal in large quantity, and a considerable proportion of it is present, either as free moisture, or as water in loose combination with the coal, which is driven off at very low temperatures. The other volatile products formed in the initial stages from the coal contain compounds of carbon, hydrogen and oxygen, which on further heating are decomposed, forming water vapor, carbonic acid and carbonic oxide. As the temperature is still further raised, the carbonic acid tends to combine more and more with the red hot carbon present, undergoing reduction to carbonic oxide. The water vapor present also acts on the hot carbon, forming hydrogen, carbonic acid and carbonic oxide, according to the familiar water gas reaction, and the higher the temperature the greater is the proportion of carbonic oxide which is formed in this manner, and the higher the quantity of steam which is thus converted into permanent gases. A small quantity of oxygen is always found in combination with carbon and hydrogen in tar; but, roughly, three-quarters of the oxygen is obtained from the gas as water on cooling, and about a quarter remains in the gas as carbonic acid and carbonic oxide.

When the coal is heated, the effect on the nitrogen is very similar to that on the hydrogen. At very low temperatures this element is evolved largely in combination with carbon and hydrogen as substances which are liquid at the ordinary temperature and condense in the tar—only small quantities of ammonia being formed; while a large proportion of the nitrogen remains in the residue coke. At higher, but still moderate, temperatures, much more nitrogen is given off from the coal, and the original volatile products are decomposed, forming ammonia, the maximum yield of which is obtained at such temperatures. At very high temperatures, although still more nitrogen is given off from the coke, the ammonia produced is now itself largely decomposed into its elements nitrogen and hydrogen by the heat, and some of it also acts upon the red hot carbon of the coke, yielding hydrocyanic acid. So that, in spite of the greater elimination of nitrogen from the coke, the yield of ammonia is decreased. Some of the nitrogen is also found in the tar—chiefly in the form of nitrogenous bases, such as pyridine. The sulphur, too, in all probability, comes off at low temperatures as compounds of sulphur with hydrogen and carbon, which, when more strongly heated, are further decomposed, yielding sulphuretted hydrogen, which can be removed from the gas without great difficulty. At still higher temperatures, the decomposition takes place with formation of carbon bisulphide. This substance is also produced at high temperatures from the sulphur still remaining in the coke, and thus increases the amount of those sulphur compounds which can only be removed with great difficulty.

Both as regards nitrogen and sulphur, therefore, as with the hydrocarbons, it is desirable that the volatile products themselves shall only be heated to a moderate temperature if a maximum yield of ammonia is to be obtained and a minimum quantity of carbon bisulphide produced. In the case of the oxygen compounds alone is there any advantage obtained by subjecting the products to a very high temperature, owing to the greater proportion of carbonic oxide and the smaller proportion of carbonic acid thus produced, and the larger quantity of steam converted into combustible gas. On the whole, however, there can, I think, be no doubt that the slight advantage gained in the latter respect is far more than counterbalanced by the deleterious action of such high temperature so far as the hydrocarbons, nitrogen and sulphur compounds are concerned.

Having thus considered in general outline the nature of the chemical changes which take place when coal is distilled, let us now follow the well-known advice of Mr. Newbigging, to project ourselves inside the retort, and, using these considerations as our guide, endeavor to ascertain how far the best conditions are maintained in the various types of retort now in use, and also in what manner the changes taking place are modified by the differences in construction and methods of working.

Except during the very early stages of the gas industry, and again during the past few years, carbonization has been almost universally carried out in gas works in long, narrow retorts set horizontally or at an angle of about 32° to the horizontal, into which the coal is charged all at once in such a manner as to cover fairly evenly the whole of the bottom of the retort, and to leave a free space above the coal throughout its full length, through which the gases produced must pass before they can reach the ascension pipe. In the main, the nature and sequence of the chemical changes are identical in both the

horizontal and inclined settings. The carbonization of the coal commences on the outside of the mass—namely, at the bottom and sides—where it is in contact with the hot walls of the retort, and also on the top, where it is affected by the heat radiated through the free space from the heated crown of the retort, and as time goes on the heat slowly penetrates from the circumference to the center of the coal. The vapors first given off are, as already mentioned, low temperature products of a similar character to petroleum. Those formed at or near the circumference readily get away from contact with the coal into the vacant space above; but here they are subjected to the further action of heat in two ways. In the first place, they come in contact with the hot walls of the retort, and, in the second place, they are bombarded, so to speak, by the heat rays which are constantly traversing the free space. The action of these two forms of heat, as pointed out frequently by the late Mr. William Young, is not quite the same, inasmuch as the former acts fairly equally on all the constituents of the gas, whereas the latter exerts a selective action and effects decomposition of certain constituents of the gas more readily than others.

Time will not allow of a further discussion on this point now; but it will be found fully discussed in Mr. Young's papers. For our present purpose, it is sufficient to note that, by the combined action of these two forms of heat, the vapors originally produced from the outer layers of the coal are subjected to considerable heat before they escape from the retort, and that the higher the temperature to which the retort is heated, the greater must be the decomposition they undergo. In addition to the temperature, there are other factors which influence the extent to which the gases are decomposed in their passage through the free space, such as the size of the charge, the pressure in the retorts (especially the extent to which this pressure undergoes variation), and the number of outlets from the retort available for the gas. Here again, however, time will not permit of a consideration of these points to-day, and I must content myself with this bare reference to them, and confine the consideration to the effects of temperature alone.

As the heat penetrates the mass of coal in the retort, the same petroleum-like vapors are given off first; but before these can reach the free space above the coal, they must pass through the hot outer layers of partly carbonized coke, which is now itself giving off chiefly permanent gases, such as marsh gas and hydrogen. The petroleum-like primary products given off during the later stages of the distillation have therefore not only to undergo the action of heat in the free space above the coal, but, before reaching this, must also pass over a surface of heated coke, the temperature and area of which constantly increase as carbonization proceeds. In consequence of this, the quality of the gas produced falls very greatly from nearly the beginning to the end of the charge, as is readily seen from the accompanying table, which shows the composition of the gas evolved at different periods in the carbonization of a good Derbyshire coal in a horizontal retort at a temperature of about 1,750° F. It will be seen that the percentages of sulphuretted hydrogen, carbonic acid, ethylene, benzene and marsh gas steadily diminish as time progresses, while that of hydrogen as constantly increases; the amount of carbonic oxide alone remaining fairly constant.

Composition of Gas Produced at Different Stages in Carbonization in Horizontal Retorts.

Hours after Commencement.	½ Hour.	1½ Hours.	2½ Hours.	3½ Hours.	5 Hours.
Sulphuretted hydrogen.....	3.8	3.1	2.8	2.1	1.2
Carbonic acid.....	3.0	2.8	2.6	2.3	1.7
Ethylene and benzene.....	8.7	5.2	3.6	2.4	0.0
Oxygen	0.0	0.0	0.0	0.0	trace
Carbonic oxide.....	4.3	5.0	4.9	4.5	3.8
Hydrogen	29.8	37.5	42.2	46.2	60.8
Marsh gas.....	49.7	42.0	39.4	37.5	26.3
Nitrogen (difference).....	0.7	4.4	4.5	5.0	6.2

When the manufacture of coal gas was first introduced, and especially before the introduction of gaseous firing, the retort temperatures attained in practice were usually not much over 1,600° F. Under these conditions the volatile products were not very materially overheated and gas of good quality was obtained, while the tar produced was sufficiently thin to flow without difficulty and contained only small amounts of the objectionable "free carbon." At the same time, the amount of naphthaline produced was not excessive, and the quantity of "light tar oils" simultaneously formed was sufficient to wash the naphthaline out of the gas fairly completely during condensation. On the other hand, the make of gas per ton at these temperatures was relatively low, as a considerable amount of volatile matter was left in the coke.

When, with the aid of gaseous firing, higher temperatures of carbonization were employed, matters were greatly modified, as the volatile matter in the coal was more completely given off and a much better yield of gas obtained. But as we have seen, it follows inevitably that in a horizontal or inclined retort having a free space above the coal, the volatile products must also be more strongly heated by an increase of temperature of the retort; and as a result of this we find that the gases and vapors are now more completely decomposed than they were under the old conditions, causing a reduction in the quality of the gas produced, as some of the carbon which was previously obtained in the form of hydrocarbons in the gas is now deposited as solid or liquid products, which either remain in the retort as carbon or are condensed with the tar and lost from a gas making point of view. Simultaneously, other disadvantageous changes occur, inasmuch as the tar formed is much thicker, thereby increasing the trouble from stopped ascension pipes and pitched hydraulic mains, and thus adding to the difficulties of practical retort house working. Further, the action of these higher temperatures results in the formation of larger quantities of naphthaline and smaller quantities of light tar oils, bringing about the advent of the naphthaline difficulty.

In spite of these drawbacks, the maintenance of higher temperatures has, on the whole, proved favorable, for although loss of carbon from the original volatile products takes place, and a lower quality of gas containing more hydrogen is produced, and the troubles in the above-mentioned respects are greatly aggravated, the increased yield of gas obtained by the more complete distillation of the volatile products from the residual coke has more than counterbalanced these disadvantages, especially in view of the fact that nowadays, owing to the introduction of the incandescent burner, a high illuminating power of the gas supply is no longer necessary. But even if it be admitted that in the employment of higher temperatures with these retorts the advantages outbalance the disadvantages, this does not form a satisfactory final solution of the problem of carbonization. What must be aimed at is a method whereby the coal can be finally heated to a very high temperature without simultaneously causing too great heating of the gases and vapors produced. From what has been said, it is evident that this is impossible with the existing arrangements in horizontal and inclined retorts having a free space above the coal; and that for this purpose a radical departure must be made from existing procedure. It is the desire to attain this end which during the past few years has led several investigators to the adoption of the vertical retort; and in the time remaining at my disposal I propose to consider the manner in which the chemical changes are modified in such retorts.

At the present time two different types of vertical retort are being tried. The first is the discontinuous type, in which, as in horizontal retorts, the coal is charged all at once into the retort and the coke discharged when the whole is completely carbonized; the second is the continuous type, in which the coal is regularly fed into the top of the retort in small charges, and the coke is removed more or less continuously from the bottom. Of the first class there are at work two examples—the vertical retort devised and brought into practical working by Dr. Bueb in Germany, and the system being tried by Mr. Love, at Guildford, of retorts set at an angle of 45°. These latter are, of course, not truly vertical retorts, but in the main they may be classed with them, as, owing to their steepness, the retort, except at the extreme top, always remains full of coal, and the sequence of chemical changes is the same as in truly vertical retorts. The Bueb retort is as yet the only vertical retort of any type which has been at all widely adopted, and its use is rapidly extending, especially in the conntry of its origin.

In the first method of construction adopted by Dr. Bueb, he endeavored to attain the desired end, of avoiding too great an action of heat on the gases produced, by employing a rectangular vertical retort which was only heated on three sides, while on the fourth unheated side ports were built at different heights to enable the gas produced to pass at once into a conduit, by which it was led away to the hydraulic main without becoming strongly heated. Of the results obtained with this form of retort, no details have been published; but experiments made with it led Dr. Bueb to the highly important discovery that the provision of these ports was unnecessary, as he found that in a vertical retort full of coal and heated on all sides, the gases produced, instead of passing through the hot coke layers on the

periphery of the retort, find their easiest way out of the retort through the interior comparatively cool core of uncarbonized coal, by means of which they make their way to the top of the retort and thence (through the ascension pipe) to the hydraulic main. The carbonization of the coal, as in horizontal retorts, takes place from the circumference to the center of the charge throughout the whole length of the retort; but owing to the abolition of the free space (except a small amount at the extreme top) the gases produced as carbonization proceeds no longer have to find their way through the highly heated outer layers of coke or to travel along the hot crown, but are able to escape through the coolest portion of the mass. In this manner they escape the excessive decomposition they receive in a highly heated horizontal retort; while at the same time the desired end of a final high temperature of the coke is attained.

The result of this is that while the make of gas per ton is at lea t as high as it is with horizontal retorts, the quality of the gas produced, and in particular its calorific power, is decidedly higher, inasmuch as the permanent hydrocarbon gases produced at moderate temperatures (more especially the ethylene and, to a lesser extent, the marsh gas) are no longer broken up with deposition of part of their carbon. Simultaneously, owing to the lower temperature to which the gases are exposed, the tar produced is now a comparatively thin oil, containing very little suspended "free carbon," and brings about no serious trouble in the way of stopped pipes and pitched hydraulic mains. Further, in spite of the high make per ton, the amount of naphthaline is lower and that of light oils higher; and these latter are sufficient in quantity to effect a fairly complete removal of the naphthaline from the gas during condensation. Moreover, in these retorts the ammonia, as well as the hydrocarbons, is protected from excessive heat and is therefore decomposed to a smaller extent into its elements, or into hydrocyanic acid by the hot coke, so that an increased yield of ammonia of some 40 per cent. is said to be obtained, and it is stated also that the amount of gaseous sulphur compounds produced, other than sulphuretted hydrogen, is greatly diminished. The coke formed, too, is harder and much denser (more like the coke produced in coke ovens), owing to the fact that in a vertical retort the coal during carbonization is, by its own weight, subjected to a much greater pressure than is the case in the ordinary horizontal and inclined retorts.

One disadvantage of the full retort, however, lies in the fact that, although the gas finds its easiest way through the core, the passage is by no means an unobstructed one, as the interstices between the larger pieces of coal are partly blocked by the dust and small always present when crushed coal is used, and consequently the pressure of the gas required to force its way out is rather high, especially at the bottom of the retort. This difficulty appears to have been to a large extent overcome by a very ingenious yet simple device due to Herr Ernst Körting, of Berlin. By his plan, instead of charging the crushed coal directly into the retort, it is first passed through a screen and divided into nuts and small. These are then charged into the retort simultaneously but separately. In this manner the stream of nuts lies largely separate throughout the retort and forms relatively easy channels by means of which the gas finds its way to and through the central core, whereby the excessive pressure at the bottom of the retort is greatly diminished.

In Mr. Love's 45° retorts, now in use at Guildford, practically the same sequence of reactions occurs as in the Bueb retort, inasmuch as the retort is always full of coal except at the extreme top, and the gas finds its way out through the central core. In like manner, a high yield of gas of good quality is obtained, with simultaneous production of a thin tar, a higher yield of ammonia and a harder and denser coke.

Of the second type of continuous vertical retorts, three examples have been or are about to be tried in this country, namely, the Settle Padfield, the Woodall-Duckham and the Young-Glover installations. These, so far as the principles of carbonization under discussion are concerned, are in the main identical. In all three forms the retort is kept full or nearly full of coal, but instead of the charge being introduced all at once, it is put in at the top in small quantities at short intervals, the coke being removed in a similar manner at the bottom. Thus the retort is never emptied in ordinary working, and the chemical changes going on are always approximately the same, instead of varying according to the length of time the charge has been in the retort, as is the case with discontinuous charging. Hence the gas given off is much more nearly of uniform quality. Working in this manner, the coal increases in temperature as it passes downwards through the retort, so that the low temperature petroleum-like products are all given off only in the upper portion of the retort. At this point the temperature within the retort is comparatively cool, inasmuch as, however highly the walls of the retort are heated, the incoming cold coal keeps the temperature down in the interior of the retort, and the outlet for the gas being at the top, these products get away without being overheated. As the partially carbonized coal gradually passes down the retort, it gives off permanent gases, which, as they ascend on their way out of the retort, constantly get into cooler and cooler regions, and simultaneously assist in driving out of the retort the more easily decomposable volatile products produced above them.

It will be seen, therefore, that, although there are differences in the manner in which the reactions of carbonization take place in the continuous and discontinuous vertical retorts, there is no such wide distinction between what occurs within them as there is between that taking place in the ordinary horizontal or inclined retorts with a free space above the coal, and in all forms of vertical or fully charged retorts. There can, I think, be no question that in all the fully charged types the ideal course of procedure is far more nearly approached than with the ordinary horizontal or inclined types, and that in them, while it is possible to drive out the maximum amount of volatile gas from the coke, excessive overheating of the volatile products themselves can be avoided, resulting in the production of gas of higher quality, more ammonia and a thinner tar free from suspended matter, which does not interfere with the proper and easy working of the carbonization plant. The relative advantages which will decide in favor of continuous or discontinuous retorts will be, I consider, not so much of a chemical as of an engineering or commercial nature.

We have seen, however, that while the exposure of the gases to an excessive temperature must be avoided, it is also disadvantageous, from a gas making standpoint, if they are insufficiently heated, and the question naturally arises whether in some or all of the vertical retort systems it may happen that the original vapors are not sufficiently heated to yield the maximum quantity of gas they are capable of producing. On this point opinions are at present divided. Messrs. Young and Glover believe that such is the case, and are, therefore, providing a special chamber above the retort where these products can be subjected especially to the action of radiant heat, while Messrs. Woodall and Duckham believe that this procedure is unnecessary. At the present time the evidence available is insufficient to permit of a definite conclusion on the point, but it seems to me that whether the additional heating is necessary or not will depend upon the relative temperature at the top of the retort and on the nature of the coal carbonized. Thus in the Woodall-Duckham retorts the highest temperature is maintained at the top, and in the Young-Glover installation at the bottom, which may materially influence matters. It is also not unlikely that coals rich in hydrogen, such as many of the Lancashire and Yorkshire varieties, might require such additional heating of the gas, which would be unnecessary with gas derived from coals poorer in hydrogen, such as those from the Durham coal fields.

Before concluding, there are one or two cautions I should like to give. In this lecture I have tried to put before you, as far as time permitted, the state of present knowledge with regard to the chemical reactions taking place in carbonization, and I have endeavored to confine myself to what I believe to be facts, or what appear to me to be reasonable deductions from those facts. I do not, however, wish you to go away with the idea that what I have said covers anything like the whole of the ground even from a chemical point of view, and still less do I wish you to accept the conclusions I have given voice to without examination on your part to see if they fit in with your own experience of the facts; for undoubtedly further work, and a fuller knowledge of the facts may, and probably will, necessitate some modification in many of the views expressed.

Moreover, it has been necessary for me to confine myself almost exclusively to the consideration of the chemical and physical principles of carbonization; and although these are of the utmost importance, and a knowledge of them essential in order to obtain the best possible results, it must be borne in mind that this information, taken by itself, would be of little use in the practical working out of the process on a commercial scale. Here other conditions of equal or even greater importance must be considered, namely, the engineering principles involved in giving effect to those chemical reactions in the best possible way, and the economical and commercial principles involved in carrying out the process at the lowest cost. Often a procedure which would be advantageous from a chemical standpoint is counterbalanced by greater disadvantages from engineering or commercial considerations, or *vice versa*, and the best results in any process can only be

obtained by the full and simultaneous study of all three sides, and neglect of any one of them must result in a lessened degree of success.

To most of us it happens that one particular side has more attractions than the others, and we are all apt at times rather to exaggerate the importance of that which interests us most and to minimize the considerations which appeal to our imaginations less strongly. If, one and all, we are on our guard against this latter tendency, and recognizing that, in gas manufacture as in other technical processes, the fullest degree of success can only be gained by all three sides pulling together in harmony towards the goal, instead of against each other, there will be little doubt of the continued success and further expansion of the gas industry in the future, in which success many of you junior members of the profession will, I have no doubt, fully bear your share.

The lecturer received quite an ovation at the close of his address, and the President (Mr. E. J. Wellens), who occupied the chair, expressed the interest he had felt in the lecture, and invited discussion or questions, which he said Dr. Colman would be pleased to answer.

Discussion.

Mr. S. Glover (St. Hellens) said the lecturer had helped them very much by projecting them in imagination into the inside of a retort. The subject of the lecture had been one which he had studied for many years—in fact, before anything on the advanced scale treated that afternoon had been published. For a very long time past he had been dissatisfied with the method of carbonization as carried on generally. It was what he might term a haphazard method, which he had often criticized, and was anxious to amend. The lecturer had not gone as deeply into the questions and results of the higher temperatures as he could have wished. The point to get at was no doubt the breaking up of the constituents of coal into the order in which Nature had welded them together. At present large quantities of coal could not be so well treated as small amounts. The importance of raising the heat had not yet been sufficiently realized. Then there were differences in the quality of coal to be dealt with. They should have power to control the heat in various parts of the retort.

Mr. D. V. Hollingworth (Salford) said they in the north were looking to such men as the lecturer for guidance. They had derived great benefit from Dr. Colman's writings. In the general methods of combustion he thought they in this part of country were distinctly stupid in carbonizing coal, as it were, in a drain - for it was more like a drain than anything else. If engineers gave more attention to the subject of charging retorts he thought better results would be obtained. They were all agreed on several points brought forward by the lecturer in the matter of heat. Why could they not have continuous charging on a highly heated surface? He did not think certain difficulties under which they labored were insurmountable.

Mr. H. Kendrick (Stretford) remarked that members of the Senior Association would have an opportunity on Saturday next of seeing vertical retorts in operation, and would be able to compare some of the results. He thought they were able to derive much information and great advantages from the different kinds of retorts now in use. Their knowledge has been increased by Dr. Colman's lecture.

Mr. J. Alsop said he had taken great interest in all that the lecturer had said, and he hoped to have the opportunity ere long to see vertical retorts in operation.

Mr. T. Glover (Norwich) said that, being in Manchester, and hearing of the lecture, he had been pleased to attend and show his interest in the subject. He had heard a great deal and read a great deal of the doings of the Manchester and District Junior Gas Association; but this was the first meeting at which he had had the privilege of being present. In the Eastern Counties, where he was living, towns were wide apart, and he was afraid that the young men there, who were expecting to be managers some day, had very poor advantages compared with those in Manchester. He had admired the young men in the Manchester district and also in the Midlands, for their enterprise and spirit. He regarded it as a happy idea on their part to invite Dr. Colman to come and discuss theory with them. They had not, he thought, studied the subject of charging retorts as they ought to have done—especially in the matter of the reaction going on in the retorts. They had carried on their work very much in a rough, haphazard, and unscientific manner. They should arrive at the best knowledge they were able to attain on the subject, and get at the highest value from a given weight of coal, and make their machinery suitable for it. So far as they had gone, results seemed in favor of the vertical retort. The systems in use on the Continent must be tested here; it was not easy to go to Germany to see them working. They could not satisfy themselves so well as if the methods were tried in this country. After a while, we in England might get something better even than Germany in our methods of carbonization. The London Companies were finding great advantages in using an extremely high temperature for carbonization. It had resulted in greatly increased carbon bisulphide constituents and in a reduced production of ammonia.

Dr. Colman, in the course of a brief reply, said the subject was after all in the experimenal stage, and in 10 years from now they would make further discoveries. He appealed to members of the Association to secure retorts which they believed would produce the best results and let those results be known.

On the motion of Mr. Thorp, seconded by Mr. Teesdale, a hearty vote of thanks for his lecture was accorded to Dr. Colman, and with his acknowledgment the meeting terminated.

Operating a Small Electric Plant.

[By Mr. W. H. Wakeman, in *Elec. World.*]

Twelve years ago I was in charge of a steam power and heating plant in which electricity was not used. About that time the idea of using electric lights was agitated and the subject was interesting, because the dynamo would be put in the engine room in case it was decided to install one. Under such conditions there is a choice of two courses open to the engineer. One is to show intelligent interest in the matter, pointing out the advantages of certain machines, and favoring the best plan for installing the same. The other is to take no interest in the subject, and then after the machine is installed, growl and find fault because he was not consulted in regard to what ought to de done and the best way to secure the desired results. Choosing to adopt the former, I secured the kind of a machine that I wanted, it was installed in the place that I favored, and my plan for the details was adopted.

This part of the subject is important, as it frequently makes all of the difference between a contented and a dissatisfied engineer. As the machine has always been ready for service when wanted, and numerous small failures in the lighting system have been repaired without serious trouble, expense or interruption to the service, it seems as if a few suggestions prompted by this experience ought to be valuable to other engineers of small steam plants in which dynamos are in use or may be installed in the near future.

In such a case the engineer feels alarmed if he is not familiar with electricity, because he may not be able to take care of the new machine and secure satisfactory results; hence he may be asked to resign in order that a more competent man may have the situation. As a general rule, to which there may be a few exceptions, this apprehension is unnecessary, because a man who knows enough intelligently to care for a steam plant, can easily learn how to operate an electric lighting system in connection with it. People who are either directly or indirectly interested in the sale of electrical machinery sometimes claim that it requires no more intelligence to operate a dynamo than it does to run a grindstone. This is evidently a mistake, as the man who has run a grindstone for a long time and is then obliged to take care of a dynamo will soon discover. Such statements are harmful, because they give too low an estimate of the service required; hence, if believed, they prevent an engineer from taking precautions to understand thoroughly the new duties and requirements, and such a course is a sure way to invite trouble and unsatisfactory results.

A compound wound, 4 or 6-pole dynamo will give satisfaction under average conditions, and is as good as any other kind for peculiar situations. When deciding on the place to locate such a machine, the coolest spot available should be selected. Where space is limited a dynamo is sometimes located on an elevated platform. (See Fig. 1.) Of course, it utilizes space that probably would not be used for other purposes, but heat rises and this fact makes such a location unsuitable unless it is ventilated much better than the average engine room.

It is assumed that this is a belted dynamo driven at a speed of about 1,000 revolutions per minute. A clutch pulley should be provided to drive it, so that it may be stopped at pleasure, and this pulley should be kept in good working order at all times. If it is thrown in and out frequently it will become loose in a few months, and, conse-

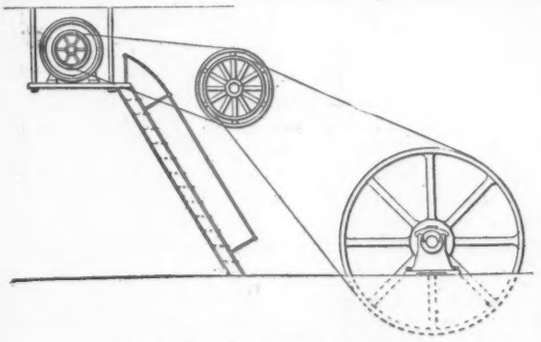


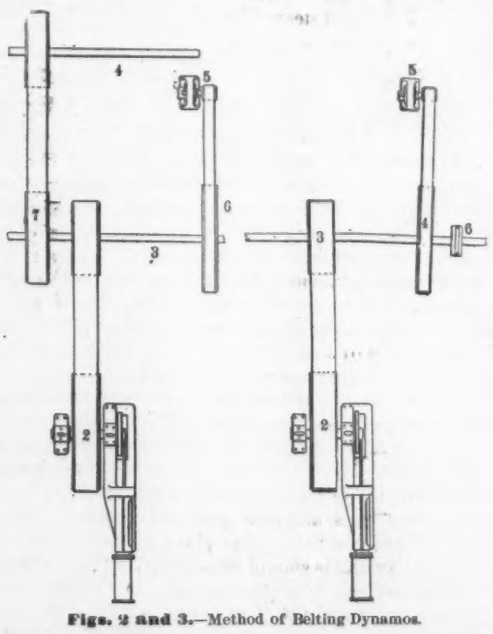
Fig. 1.—Dynamo on Elevated Platform.

quently, on some cloudy day when all of the lights are needed, it will slip and fail to carry the load. A clutch gives warning of this, but it is not always noticed by the engineer in time to save complete failure. When a clutch is properly adjusted, the lever goes in hard, but as time passes and the rubbing parts wear slightly, it goes in easier; the difference should be carefully noted and another adjustment made before it gets too loose to carry the load.

When plans are being made and considered for installing a dynamo, it often appears as if it might be driven by an ordinary pulley on a shaft that must always revolve when the engine is running; while this is possible it is not practicable, and hence is unworthy of adoption. If a clutch pulley is not adopted, then use a countershaft with a tight and loose pulley, but do not fail to provide some device for stopping the dynamo while the shafting is running. Furthermore, it is a good idea to provide means for running the dynamo while the mill shafting is at rest, as it will prove very convenient to have good lights in case it becomes necessary to change shafting or pulleys, or when other work must be done at night for which the shafting is not wanted. Fig. 2 illustrates this idea, as it shows an engine, 2, driving a jack shaft, 3, from which power is transmitted to the main shafting, 4.

The dynamo, 5, is driven from the jack shaft, 3, by a clutch pulley, 6, and therefore can be stopped at pleasure. When lights are wanted, and the shafting is not needed, 6 is kept in, but 7 is also a clutch pulley, and can be thrown out.

In some shops and mills there is no jack shaft, as the main belt transmits power direct to the shafting. This is illustrated in Fig. 3



Figs. 2 and 3.—Method of Belting Dynamos.

in which 2 is the flywheel, 3 the main pulley, 4 a clutch pulley driving the dynamo 5; 6 is a cut-off coupling, and therefore the shafting beyond this point can be stopped at any time while the dynamo is still in use.

When the dynamo mentioned in the beginning of this article was delivered at my engine room I found that it was intended to run in the opposite direction from which it must revolve in this place. Fig. 4 shows how the carbon brushes were set, and the arrow indicates the direction of rotation. It could be used in this way with carbon brushes, but copper brushes would be ruined at once if an attempt was made to turn the commutator in this direction. However, it would never look right, and hence the brushes were reversed, as shown in Fig. 5.

Before making an attempt to change brushes in this way, the engineer should note that each one bears on the commutator nearly opposite the center of a field coil; therefore, when they are reversed the combined brush holders should be turned by a handle provided for that purpose until each brush bears on nearly the same place as before. This is shown in Figs. 4 and 5. It is not proper to set them exactly in their former position, but if put opposite the center of each field coil it will be near enough for trial, and the proper position can be determined by experiment after the dynamo has been installed and while running at full speed as follows: Suppose that 114 volts are wanted at the switchboard in order to secure 110 at the lamps, but the pointer indicates only 75, with the rheostat in the position shown in Fig. 6. Turning the indicator from right to lift causes the voltage to rise, but it may have to be turned as far as it will go in order to secure 114 volts. This is not satisfactory, because under ordinary working conditions it ought not to be turned more than one-half way around, thus giving an opportunity to adjust it in either direction if necessary.

The above mentioned result shows that the brushes are not in the right place, and therefore they must be turned until the voltage is brought up. The direction in which they must go can be determined by experiment, and it will do no harm to turn them in the wrong direction by mistake, as it will only reduce the voltage. In a certain plant that I visited, the engineer cannot reduce his voltage below 114 under common working conditions, even with the rheostat turned in as far as it will go. This is not a good plan, for if the engine speed should be accidentally increased, it might increase the voltage to a damaging point. Of course the same thing would happen if the speed was suddenly increased while the rheostat is in the central position, provided the engineer was not there instantly to turn it down. As this has happened twice in my plant, on account of an engine that does not regulate closely under quick changes of load, and as the same conditions are sometimes found elsewhere, this is an important point.

If the carbon brushes are left square they form but slight contact with the commutator. This will do no harm provided it can be run with only a few lamps on for several hours, until the natural wear gives better contact between the two surfaces. If this is not practical it is a good idea to take a strip of sandpaper, as wide as the brush, put it between the brush and the commutator, with the smooth side next to the latter, and draw it back and forth until enough of the brush is removed to make a good fit.

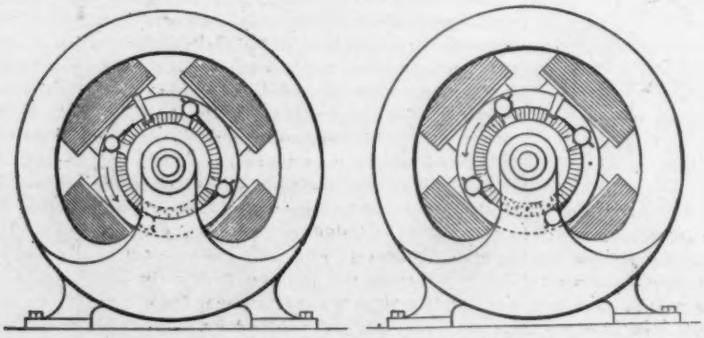
An effort should be made to arrange matters so that the new dynamo may be run with a light load for at least 2 or 3 days, and care should be taken to know that the bearings are well lubricated during this time; for if they are not perfectly smooth when first used they may heat, and if not given an abundance of oil at this time the babbitting may be disturbed sufficiently to cause trouble afterward by always running warm. This is not only annoying, but is also dangerous, because the armature should never become warmer than 90° F. (50° C.) above the temperature of the room, and cool bearings assist in keeping the armature temperature down. Furthermore, when such bearing really begin to heat they quickly reach the melting point; hence, if the outer parts are comparatively cool in regular service, it gives the engineer a better chance to discover the cause of trouble and provide a remedy than if the bearing was always warm and must only become a few degrees warmer in order to melt the babbitting.

After a dynamo has run cool for a month or more it is only natural for the engineer to expect it to continue to do so, especially if it is fitted with oil reservoirs and ring oilers. These are excellent devices, which save much trouble and care, but they should not be neglected. It does not take long to remove a brass plug or lift a cast iron cap to ascertain if there is oil in a reservoir, or if the ring oiler is revolving properly, but failure to do it has caused more than one hot box. I have known a reservoir to remain nearly full of oil for 6 months, then to became nearly empty without apparent cause. In view of this it is plain that safety lies in daily inspection of these parts.

When a dynamo is overloaded, or in other words, when more load is put on than the machine was designed for, it will cause the brushes and armature to heat, and after a reasonable time this heat will be transmitted to the frame.

If an overload is the real cause of trouble it can be determined by

comparing the ammeter readings with the rated capacity of the dynamo. For illustration, I have a 15-kw. belted dynamo to which there are nearly 400 incandescent lamps connected; and as each one requires about ¼ ampere, it would require about 200 amperes to carry them all. Since this machine is good for 15,000 watts, and by dividing this by the voltage, or 112, we find the amperes to be 134. The actual load is frequently 140 amperes and it has risen to 150 for 2 hours or more without serious trouble, but if more than this is put on, one switch is pulled out to prevent damage to the dynamo.



Figs. 4 and 5.—Location of Brushes.

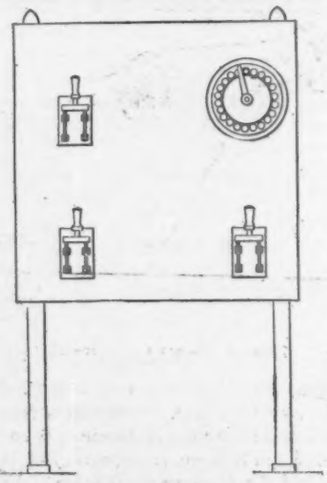


Fig. 6.—Switchboard.

When the brushes and frame begin to heat, the engineer may conclude that too much friction is caused by contact of the revolving armature and the stationary brushes, and consequently he proceeds to lubricate the commutator. This, however, is not always necessary, and sometimes it is harmful. A poor grade of oil is occasionally applied by means of a piece of waste, but it is useless, and the burnt sediment left behind it is detrimental to good service. A piece of the waste may be caught on the commutator and carried under the brushes, thus making it necessary to stop the dynamo and remove the cause of trouble.

Only a little lubrication is ever necessary at this point, and some of the lubricants prepared and sold for this purpose should be sparingly used, if anything is really needed. Keep the commutator bright and clean, and little else will be required. Use a medium grade of sandpaper for this purpose (never emery cloth), and always put it on the inside of a block of wood that is fitted to the curve of the commutator.

After the brushes have been used a long time they will be worn down so that each one will cover two bars in the commutator. It is a good idea to take them out and file them until the point of contact is not more than ¼ inch wide.

Use a pair of hand bellows to blow dust out of the coils of wire, and keep the remainder wiped clean with good waste. Provision is usually made for moving a dynamo forward to take up slackness of the belt, which may therefore be made endless, requiring no laced joint. This is important, because the lamps will show variation of energy every time that a laced joint passes over the dynamo pulley. After shutting down at night, loosen the belt to give it a chance to relax.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE State Railroad Commission has been appealed to by the authorities of Appleton, Wis., to cause a revised and reduced scale of rates for the sale of gas and electric currents by the Wisconsin Light, Heat and Power Company.

MR. FRANCIS STEWART has resigned the position of Manager of the Washington (Iowa) Gas and Electric Company. His successor is Mr. Clarke Carson, of Davenport, Iowa. Mr. Stewart has allied himself with the American Pearl Button Company.

MR. W. S. BROWN, of Chicago, having secured quite an interest in the Emporia (Kas.) Electric and Gas Company, has assumed the managership thereof, succeeding Mr. H. R. Brokaw.

IT is noteworthy and of value as an indication of common sense, that the Committee on Light of the Richmond (Va.) City Council, has reported against the resolution referred to it by the Council proper directing that the gas rate be reduced to 80 cents per 1,000 cubic feet; the ruling charge is $1. The Committee, as the main cause for its action, declared a reduction was inexpedient in that the expenditure on rehabilitation account now going on in connection with the gas plant would amount to at least $400,000. Another interesting appendix to the resolution (the whole matter was brought before the Council by Ald. John J. Lynch) was to oblige each department of the city government to pay for the gas used by it according to meter measurement, or to settle up just as ordinary consumers do.

THE management of the Augusta (Ga.) Gas Light Company is complimenting itself on the great results that have attended the reorganization of its New Business department, which reorganization and carrying out have been under the direct supervision of Mr. R. M. Worden.

FROM its annual report, submitted to Congress by the Washington (D. C.) Gas Light Company, for the first time under the law passed some months ago, covering its operation for the year ended December 31, 1906, it is noted that the paid for sendout amounted to 1,729,922,035 cubic feet, that the average price received for gas was $1.009 per 1,000, that the total revenue from bye-products was $53,623.65, divided as follows: Coke, $35,626.40; tar, $13,447.59; ammoniacal liquor, $4,559.66. There were used in the manufacture of gas, 33,393 tons gas coal; 15,433 tons anthracite coal; 3,589 tons steam coal, and 9,946,738 gallons of oil; actual cost of extensions on works' account, paid out of earnings, $96,627.68. The taxes paid to the District of Columbia amounted to $103,820.42, and the sums paid on account of meter inspection and to plumbing inspection account, footed up to $5,242.88.

MR. W. E. MOCKETT, well known to the fraternity from his connection with the United Gas Improvement Company, and to the Dallas (Tex.) Company, and still more recently in the service of the Utah Gas and Coke Company, of Salt Lake City, has associated himself with the Lloyd Construction Company, of Detroit, Mich. At present Mr. Mockett is making a short trip amongst the New England Companies. It does not here seem out of place to say that this association is bound to be a mutually pleasant and profitable one to the employer and to the employed.

ON the 8th inst a committee of representative citizens of St. Catherines, Canada, petitioned the City Council to name a delegate who is to be instructed to visit the Minister of the Interior, Canadian Government, to urge him to prohibit the exportation of natural gas across the frontier, for ultimate use in Buffalo, N. Y.

THE new gasholder for the Elkhart (Ind.) Gas Company is in active service, much to the comfort of the residents and to the peace of mind of the operators of the Company.

THE Public Service Commission for the Eastern section of New York has authorized the Nassau Light and Power Company to acquire the capital stock of the Oyster Bay (L. I.) Electric Light and Power Company.

WE are indebted to the Safety Gas Main Stopper Company, of 257 East 133d street, New York, for a good working specimen of a 13-inch straight rule, of birdseye maple.

COMMANDER H. T. RODMAN, U. S. N., Sixth Lighthouse District, is responsible for the recommendation to his superiors that the oil lamps in the lighthouse of his district (Charleston, S. C., is headquarters thereof) be replaced by lights and lamps of the acetylene type.

THE Directors of the Equitable Illuminating Gas Light Company, of Philadelphia, Pa., have declared a semi-annual dividend of 3 per cent. on the preferred stock, payable to-day.

THE proprietors of the Charlestown (Mass.) Gas and Electric Light Company have petitioned the Board of Gas and Electric Light Commissioners for permission to issue additional stock in the sum of $100,000, the proceeds to be devoted to the payment of its floating debt and to provide for necessary additions to the plant.

"T. L. G.," writing from Columbus, O., under date of the 8th inst., says: "As I thought the final disposition of the case outlined below and the ending thereof might interest your readers, I send you this mention of it. On the 3d inst. the city of Columbus received an adverse verdict in Judge Rathwell's court, before a jury, in the instance of its suit against the Columbus Natural Gas Company. Several years ago the Columbus Company petitioned the city for a franchise, under which it might distribute natural gas in that city, and as a guarantee of its intention deposited $20,000 in the city treasury, to become the property of the city when the Company accepted the franchise on the passage thereof. The ordinance was passed, but owing to the changes in business conditions, etc., the franchise was unnecessary to its trading—such things have been done before, of course. Having obtained a foothold without the ordinance, naturally the Company sought its deposit and the city quite as naturally sought to retain it. The Company brought suit for the principal, with interest added, and this contention was the one decided. Neither side in the case introduced in evidence a copy of the ordinance granting the franchise, and the Company simply alleged that the ordinance had never been accepted by it, and averred that the ordinance in full had never been published. It was shown that when the ordinance was finally passed the Company had disposed of its interest to another concern which had the necessary authorization, pleaded a list of technical objections, and flatly refused to accept the instrument. The city, when demand was made for the deposit, asserted that the Company had merely applied for the franchise as a means of coercing the competitor which finally bought it out, and denied the Company's right to the sum in dispute, claiming it had been forfeited. Former City Solicitor, Mr. James M. Butler, testified that at the time the money was deposited it was *verbally* agreed that the city was to have the money when, and only when, the franchise had been formally accepted. In the end, Judge Rathwell held that the case hinged on the question of acceptance or non-acceptance of the franchise, and that as the testimony preponderated in favor of non-acceptance, directed a verdict in favor of the Company. The case has attracted much attention in this section."

THE working terms of the public lighting contracts of the city of New York for the commercial year will not be changed in any essential respect.

A CORRESPONDENT in Elmira, N. Y., writing under date of the 5th inst., incloses the following: "The Committee of Council's of this city having in charge the expenses of operating and maintaining the city hall, have found it necessary to substitute coal for natural gas under the boilers. Natural gas has been used in the city hall for 2 years or more, but when the bill for gas used in November was received, the amount was so greatly in excess of any former prices that haste was made to discontinue the service. By the new rate for natural gas it cost $70.28 to heat the city hall during the month of October, or nearly $6 a day. A total of 473,000 cubic feet of gas was burned, which, figured at the increased cost of 40 cents per 1,000 feet with no discount, amounted to the above sum. This, when contrasted with the amount of gas consumed in October, 1906, when a total of 506,000 cubic feet of gas was used, slightly more than was used this year, yet the price for the product was only $91.08 figured at 20 cents per 1,000 with a 10 per cent. discount."

MR. W. S. HICKS incloses the following from the Harrisburg (Pa.) *Patriot*, dated the 9th inst.: "The Harrisburg Gas Company has leased the Dauphin County Gas Company and at the present time controls all the gas used in this city, Steelton, Middletown, New Cumberland, Lemoyne, Penbrook and Oberlin. While the officials of the Companies will not say for what term of years the Dauphin Company has been leased, it is understood that the two Companies are practically consolidated, or will be soon. The lease became effective December 1. Gas will be produced for the present in this city, where a new holder with a capacity of 1,500,000 cubic feet is being constructed, and at Steelton. Later on producing plants may be erected in some of the cross-river localities. The Dauphin County Gas Company, incorporated several years ago, with J. G. Diffenderfer at the head, will go out of existence and the Company will now be known as the Harrisburg Gas Company. The general offices will be located at 14 South Market Square, at the location of the old local Company, and Luther S. Williams will be the Manager. Mr. Diffenderfer has become the Commercial Agent of the Harrisburg Company and his office will be located in this city. The main office of the Dauphin Company was located on North Front street, Steelton. This office will become a receiving office of the Harrisburg Company. There will be a branch office at Middletown also. All the bookkeeping will be done here. When the Dauphin County Company was formed 2 years ago it succeeded the Steelton Gas Company, and Mr. Diffenderfer became the General Manager. The Dauphin Company then extended its pipes out in all directions, even furnishing houses in East Harrisburg, outside the corporate limits of the city, with gas. A hundred employees are on the rolls of the Dauphin Company, but there will be a few changes. The Steelton plant will have to be run as usual and most of the employees' names will be transferred over to the books of the Harrisburg Company. The price of gas will not be changed."

AS the result of an agitation actively fostered by two worthies, respectively named John Kivlan and Chas. M. Boutwell, the Board of Gas and Electric Light Commissioners has been petitioned to order a hearing respecting the charges for gas by the Leominster (Mass.) Gas and Electric Light Company, with a view to a reduction therein. The ruling rate schedule in Leominster is asfollows: Gross per 1,000 cubic feet, $2, with these discounts: Over 500 and up to 1,000 per month, $1.70; 1,000 to 2,000 cubic feet, $1.60; 2,000 to 5,000, $1.50; over 5,000, $1.40. Messrs. "K. & B." have their minds fixed on a straight rate of $1.25 per 1,000 cubic feet, which, under the conditions now existing in Leominster, would be confiscatory. It might be possible to put the rate on 20 per cent. of the consumption in the city at $1.50 per 1,000; in the remaining 80 per cent. a rate of $1.65 would not be at all excessive, considering the average size of the accounts.

"THE new offices and salesroom of the Greenfield (Mass.) Gas Light Company were opened for inspection by the public the evening of the 9th inst. That the event was a record-making one may be well appreciated when I say that every family in the place must have had at least one representative at 'the opening.' The office is located in the center of the city, and in one of the handsomest business quarters of which we boast—the Kennedy Block. The display was certainly a creditable one, both as to quantity and variety of goods shown and as to the manner in which it was conducted. The show of fireplace goods, such as mantels, sets for fireplaces, andirons, etc., would certainly do credit to many a larger Massachusetts city than Greenfield. A prize of a very ornate reading lamp, Welsbach type, was offered to the visitor whose estimate of the number of persons visiting the office during the week was nearest the mark. The Company's output shows a great gain over the sendout for the corresponding days of last year—from November 1st to December 8th.—R."

MR. GUILFORD WILLIAMS has resigned from the service of the Portsmouth (O.) Gas Company.

THE new holder for the Green Bay (Mich.) Gas and Electric Company is in successful operation, the Kerr Murray Manufacturing Company (its constructors) having kept right to their contract.

MR. CHARLES S. BELL, foreman of the Portland (Ore.) Gas Company, and in its employ since 1897, died at his home in that city, some days ago. He was in his 36th year, and was prominent in the Order of Elks.

MR. S. P. COBB has been appointed Superintendent of the Canandaigua (N. Y.) Gas Light Company, vice Mr. W. R. W. Griffin, who has been promoted to the Superintendency of the Rochester (N. Y.) Railway Company.

THE Noblesville (Ind.) Gas Company has filed a notice of an increase in its capital stock to $60,000 from $30,000.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.
Telephone, 2996 John.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance.
Single copies, 10 cents.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, DECEMBER 16, 1907.

The Market for Gas Securities.

The market for gas securities, in common with the general share market, sold off quite a bit during the week. That there was specifically good reason for a smart advance in Consolidated—in ordinary times the news would have moved the stock at least 20 points—was out in the shape of the decision of the Court of Appeals stamping its assent on the right of the Astoria Company to build a tunnel under the East River. However, the stock went down instead of up. In any event, we will hear no more about the "Remsen gas grab."

Brooklyn Union undoubtedly reflects forced sales in liquidation of called loans; and the price at which its bonds are offered for sale (92½) is absurdly low. Peoples, of Chicago, holds steady. Speaking of bonds, what is the matter with New Amsterdam bonds? Just look at the figures.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	90	90½
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	92	97
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	..	170
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	80	95
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	90	98
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	100	105
Con. 5's, due 1945, J. & J.	1,500,000	..	97	101
Standard	5,000,000	100	70	100
Preferred	5,000,000	100	100	125
1st Mtg. 5's, due 1930, M. & N	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	80	85
1st Con. 5's, due 1945, M. & N	15,000,000	..	91½	92
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	¼	⅜
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
" " Bonds, 5's	5,250,000	1,000	63	66
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106½
Cincinnati Gas and Electric Co.	29,500,000	100	93½	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	92	98
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	87	88
Pref'erred	3,096,500	100	107½	108
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	..	90
Mortgage, 6's	3,000,000	..	..	113
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	850,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,515,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	55	
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	102	105
" Bonds, 5's	10,500,000	..	101	102½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	.
" 1st Mtg. 5's	220,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	100
Preferred	2,500,000	100	75	100
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	250,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies of Boston	25,000,000	100	47½	48
Preferred	25,000,000	100	77¼	78
Montreal, Canada	2,000,000	100	215	215¾
Nashville Gas Lt. Co	1,000,000	100	110	.
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	5,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. Lt. & Coke Co., Chicago	25,000,000	100	76½	78
1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	00	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	850,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	.
Washington, D. C	2,600,000	20	345	365
1st Mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600,000	50	250	..

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, PA., Dec. 11, 1907.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Jan. 15th, 1908, to stockholders of record at the close of business, Dec. 31, 1907. Checks will be mailed.

1697-5 LEWIS LILLIE, Treasurer.

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Position Wanted

As Manager of Gas, Electric, or Combined Property.

Twelve years' successful experience as manager and engineer. Best of reference. Can invest small amount in property. In city of not less than 25,000. Address, "A. D.,"
1695-4 Care this Journal.

Position Wanted

As Manager or Superintendent.

Am 29 years old, have had 10 years' practical experience in the manufacture and distribution of coal and water gas. Thoroughly conversant with accounting and commercial end of the business. Best of references.

1696-2 Address, "B. G. W.," care this Journal.

Position Wanted

As Superintendent of Gas Company,

By young man of 7 years' practical experience in the manufacture and distribution of both coal and water gas. Desires position as superintendent in city of 10,000 to 25,000 population. Best of references.

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Position Wanted

By gas engineer, experienced in manufacture, distribution and construction. Can furnish best of references.

Address, "L. A. S.,"
1697-1 Care this Journal.

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By one who has had wide practical experience and has met with success in above capacity. Can furnish excellent references. Address, "J. O.,"
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As Manager or Superintendent of Gas Company.

Am well versed in both the construction and operation of coal and water gas works. Can give the best of references.

Address, "D. E. C.,"
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A young man, well educated, single, 29, of excellent habits and Christian character, 10 years' experience all departments gas and electric business, would change position to manage office department gas or electric company, about Jan. 1. Fully competent to take charge collection office, appliance sales, complaints, investigations, etc. Familiar with up-to-date systems corporation accounting. Prefer city 20,000 to 30,000, in Northern New Jersey or New York. Best of references.

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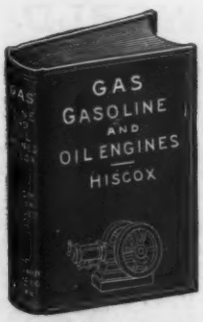

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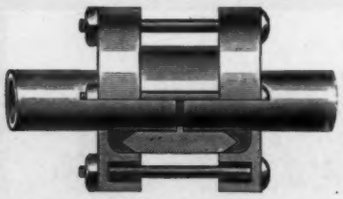
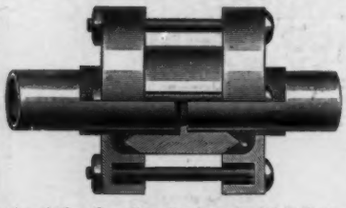
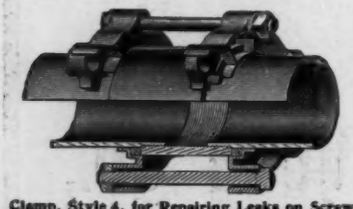


Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.



Insulating Coupling, Style 5, for Plain End Wrought Iron Pipe.



Clamp, Style 4, for Repairing Leaks on Screw Collar.

Long Sleeve, Style 2, for Mending Broken Lines.

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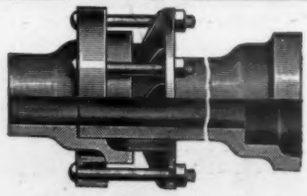
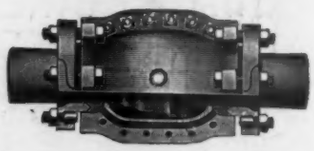
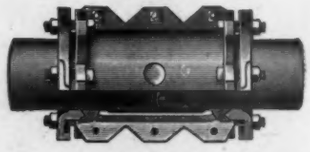


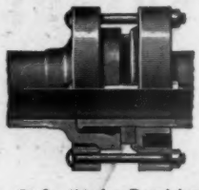
Coupling, Style 9, for Special Style Cast Iron Pipe.



Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.



Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.



Clamp, Style 4½, for Repairing Leaky Lead or Cement Joints in Cast Iron Pipe.

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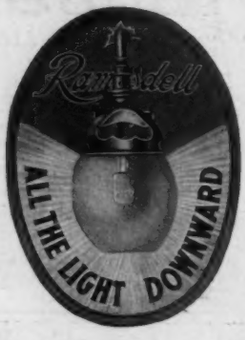

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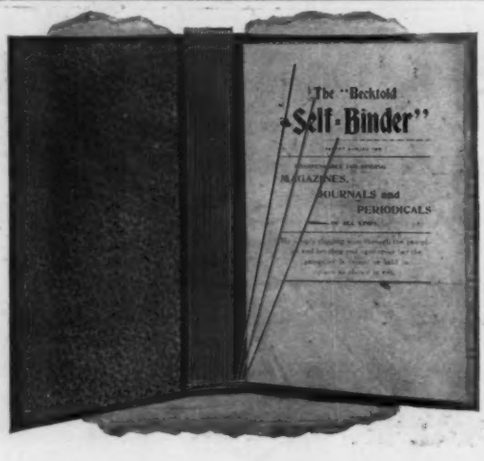

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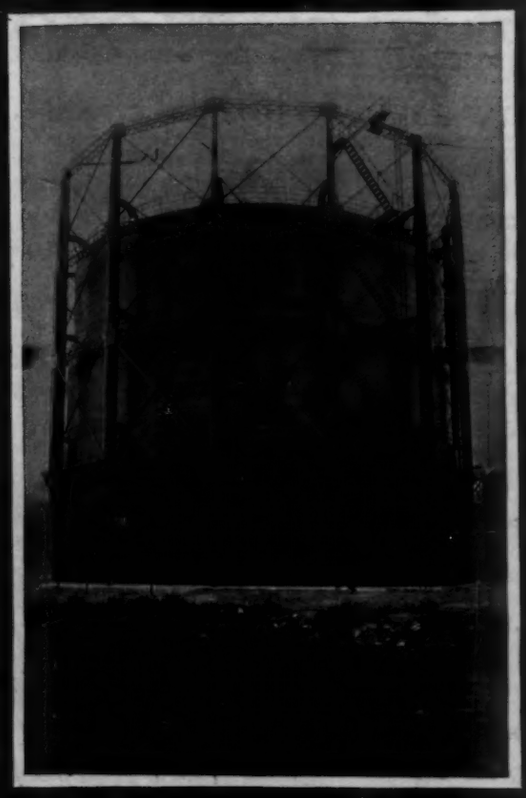

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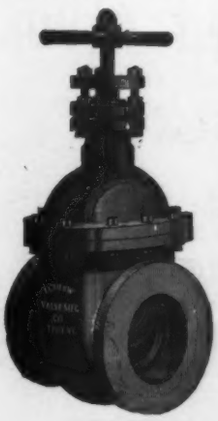

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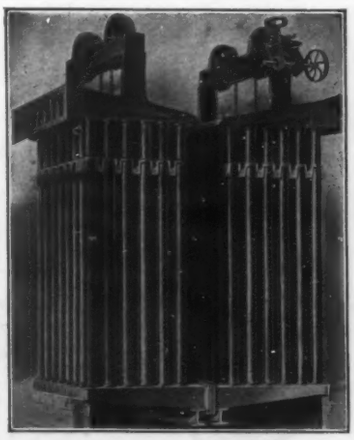

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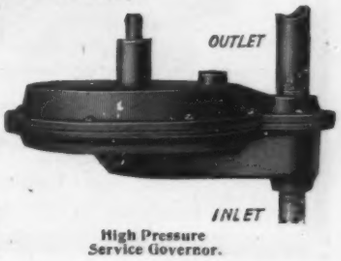

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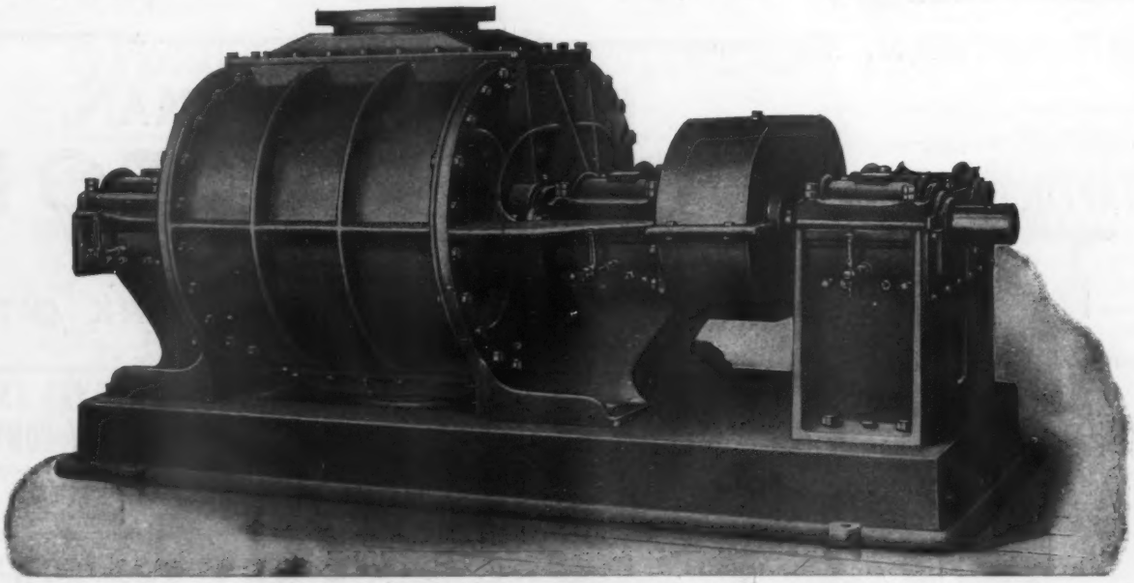

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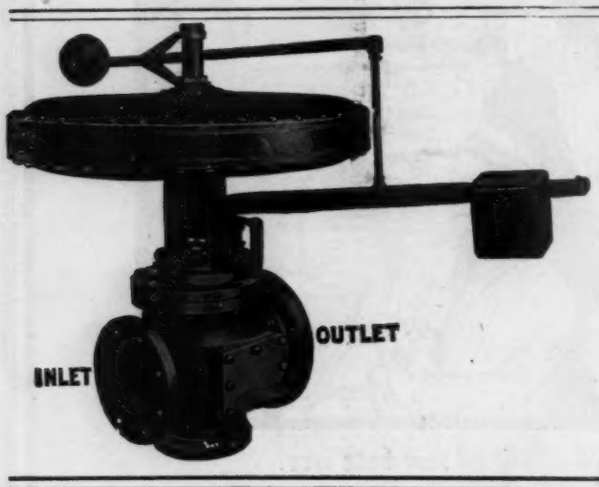

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

JANUARY, 1908.

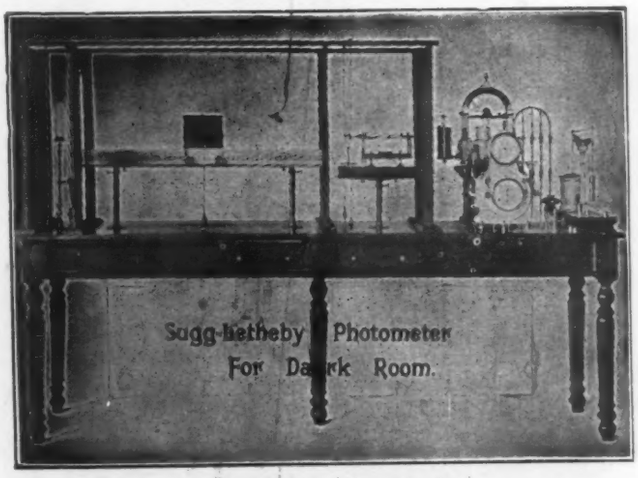
Table No. 1.
FOLLOWING THE MOON.

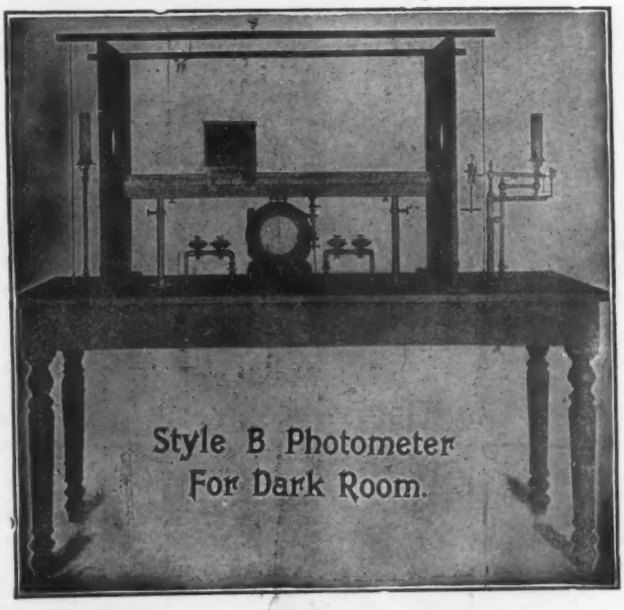
Day of Week.	Date.	Light.	Extinguish.
Wed.	1	5.10 PM	6.20 AM
Thu.	2	5.10	6.20
Fri	3	5.10 NM	6.20
Sat.	4	5.10	6.20
Sun.	5	5.20	6.20
Mon.	6	5.20	6.20
Tue.	7	5.20	6.20
Wed.	8	9.40	6.20
Thu.	9	10 50	6.20
Fri.	10	11.50 FQ	6.20
Sat.	11	12.50 AM	6.20
Sun.	12	2.00	6.20
Mon.	13	3.00	6.20
Tue.	14	3.50	6.20
Wed.	15	4.50	6.20
Thu.	16	5.40	6.20
Fri.	17	No L.	No L.
Sat.	18	No L FM	No L.
Sun.	19	No L.	No L.
Mon.	20	5.30 PM	8.00 PM
Tue.	21	5.30	9.00
Wed.	22	5.30	10.00
Thu.	23	5.30	11.00
Fri.	24	5.30	12.00
Sat.	25	5 30	1.00 AM
Sun.	26	5.40 LQ	2.10
Mon.	27	5.40	3.20
Tue.	28	5.40	4.20
Wed.	29	5.40	6.10
Thu.	30	5.40	6.10
Fri.	31	5.40	6.10

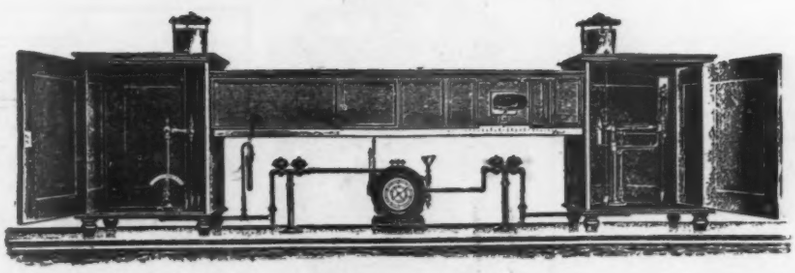
TOTAL HOURS DURING 1908.

By Table No. 1.

	Hrs.Min.
January	228.30
February	187.30
March	192.00
April	160.10
May	155.10
June	138.00
July	155.50
August	173.40
September	185.20
October	214.00
November	218.10
December	226.40
Total, yr.	2235.00







Closed Photometer For light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

JANUARY, 1908.

Table No. 2.
NEW YORK CITY.
All Night Lighting.

Day of Week.	Date.	Complete Lighting in One Hour	Complete Extinguishing in 50 Minutes
		From Time Given	
		P. M.	A.M.
Wed.	1	4.12	6.27
Thu.	2	4.12	6.27
Fri.	3	4.12	6.27
Sat.	4	4.12	6.27
Sun.	5	4.12	6.27
Mon.	6	4.12	6.27
Tue.	7	4.12	6.27
Wed.	8	4.22	6.22
Thu.	9	4.22	6.22
Fri.	10	4.22	6.22
Sat.	11	4.22	6.22
Sun.	12	4.22	6.22
Mon.	13	4.22	6.22
Tue.	14	4.22	6.22
Wed.	15	4.32	6.17
Thu.	16	4.32	6.17
Fri.	17	4.32	6.17
Sat.	18	4.32	6.17
Sun.	19	4.32	6.17
Mon.	20	4.32	6.17
Tue.	21	4.32	6.17
Wed.	22	4.42	6.12
Thu.	23	4.42	6.12
Fri.	24	4.42	6.12
Sat.	25	4.42	6.12
Sun.	26	4.42	6.12
Mon.	27	4.42	6.12
Tue.	28	4.42	6.12
Wed.	29	4.47	6.07
Thu.	30	4.47	6.07
Fri.	31	4.47	6.07

TOTAL HOURS DURING 1908.

	Hrs.Min.
January	481.50
February	329.15
March	351.50
April	341.50
May	233.05
June	218.10
July	282.55
August	254.55
September	292.25
October	420.45
November	374.30
December	411.05
	3992.35
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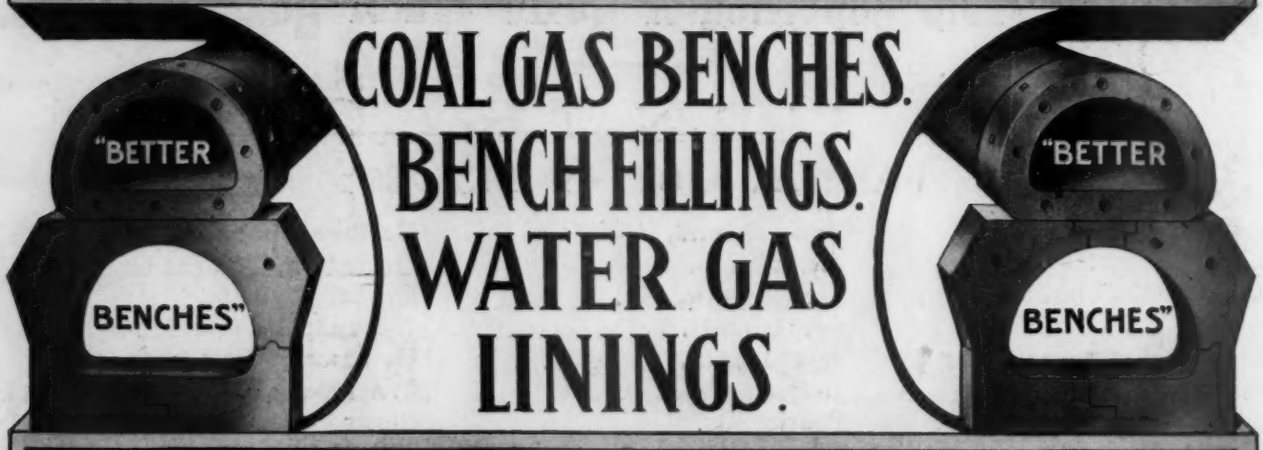

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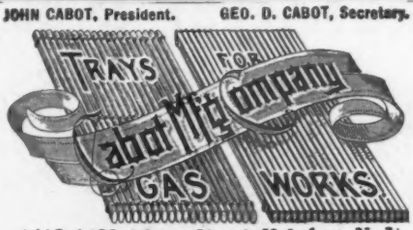

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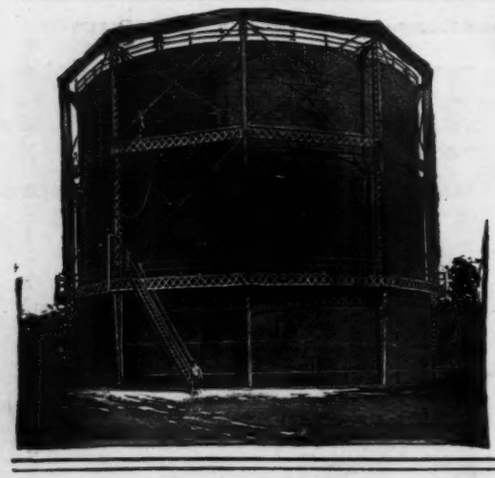

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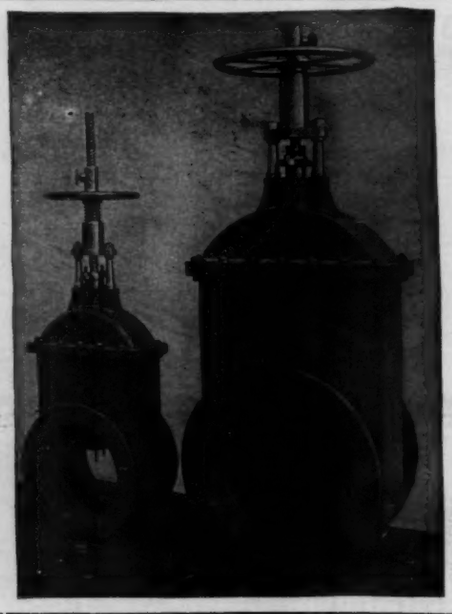

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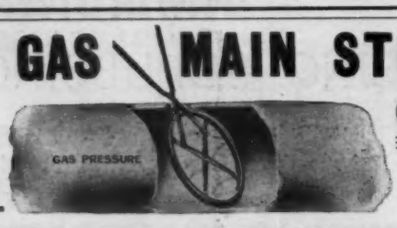

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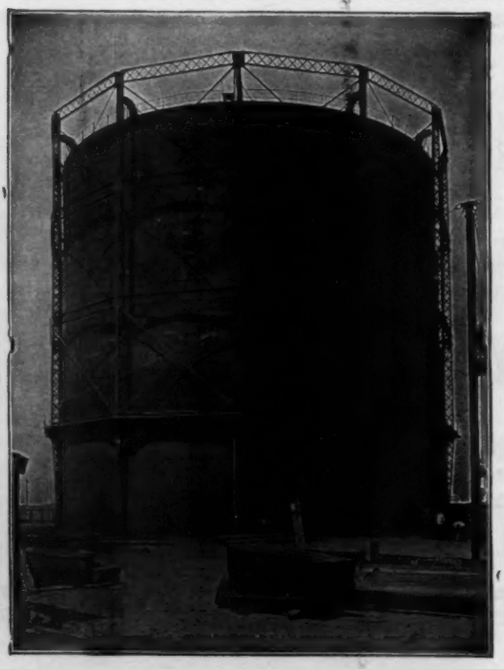

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